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ABSTRACT

The study of non-college-attending, male high school graduates examines vocational, general, and college preparatory high school curricula and certain post-school training opportunities to uncover differences in their effectiveness, either alone or in conjunction with post-school programs, in preparing youth for careers. Based on data from the National Longitudinal Surveys of Young Men 1966-69, the following serve as criterion measures in a multivariate framework: a general occupational information test, attitudes toward adequacy of preparation, participation in post-school training, skill level of jobs, wages, measures of career potential, overall job satisfaction, and unemployment experience. Multiple regression is used to identify and measure the net effects of educational and training variables by controlling statistically for other influences, with separate analyses conducted for white and black youth. The empirical findings reported and discussed for each criterion measure are summarized and provide the basis for specific conclusions which do not support the view that vocational education at the secondary level is superior preparation for the world of work. Four major implications for secondary education are drawn from the findings. A 14-page bibliography, a discussion of statistical tests of the significance of intergroup differences in regression, and tabulated regression results are appended. (Author/MS)

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THE CONTRIBUTIONS OF VOCATIONAL EDUCATION, TRAINING AND WORK EXPERIENCE ~~to~~ THE EARLY CAREER ACHIEVEMENTS OF YOUNG MEN

by

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John T. Grasso

This report is the author's Ph.D. dissertation, presented to the Department of Educational Development of The Ohio State University. The research was supported by the Center for Human Resource Research as part of its National Longitudinal Surveys Project. The latter is sponsored by the Manpower Administration, U.S. Department of Labor under the authority of the Comprehensive Employment and Training Act of 1973. Researchers undertaking such projects are encouraged to express their own judgment. Interpretations or viewpoints contained in this document are those of the author and do not necessarily represent the official position or policy of the Department of Labor.

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FOREWORD

This report is a study of the preparation of young men for the world of work in America. Specifically, the study examines several different high school curricula--the vocational, general, and college preparatory programs of study--as well as certain post-school opportunities for training youth for careers. The basic question at which Dr. Grasso directs the analysis is whether there are differences in the effectiveness of the several high school curricula--either alone or in conjunction with post-school training programs--in preparing young men for work.

Based upon data from the National Longitudinal Surveys of Young Men for the years 1966-1969, the analysis is confined to high school graduates who did not attend college. A wide variety of vocationally-relevant items are used as criterion measures in the study: (1) scores on a test of general occupational information, (2) attitudes of the youth toward the adequacy of their preparation for work, (3) participation in post-school programs of various kinds, (4) skill level of first and subsequent jobs, (5) average hourly earnings, (6) measures of long run career potential, (7) overall job satisfaction, and (8) unemployment experience.

In brief, the findings do not support the view that the vocational curriculum is superior to other high school curricula in preparing youth for work. The author finds that vocational students were undistinguished in their general knowledge of occupations and in the expressed desire for--and subsequent acquisition of--post-school training. Analysis of the skill level of the post-school jobs obtained by the youth also failed to indicate an advantage for graduates of vocational programs. Comparisons of graduates of the different programs with respect to the other criterion measures produced mixed findings for white youth. In contrast to the findings for whites, virtually no curricular differences were found on any measure for young blacks.

In his final chapter the author relates his findings to several aspects of the continuing debate about education and training policies. Chief among his policy recommendations is that schools make greater efforts to inform youth, their parents, and the communities they serve about the wide variety of career opportunities that exist, the ways in which curriculum offerings relate to various career possibilities, and--in the same context--the role and importance of existing post-school training and

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learning opportunities. In addition, authorities are urged to increase the accessibility of post-school training to all youth. With respect to the latter, the racial differences he has found suggest to the author the need for continuing efforts to reduce discrimination and to assist the process of work establishment among young blacks.

Herbert S. Parnes
Project Director

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CHAPTER I

INTRODUCTION

The education and training of youth has been for many decades a subject of special interest in the United States. Particularly during the past twenty years, a variety of issues important from both individual and social perspectives have come to national attention, often culminating in the passage of federal legislation. Among the landmark bills enacted during the period are the National Defense Education Act, the Area Redevelopment and Training Act, the Civil Rights Act, and the Elementary and Secondary Education Act.

A key issue among the subjects of continuing interest is the role of the secondary school in preparing youth for employment. At the national level, major legislation was passed in both 1963 and 1968 to reform and re-emphasize vocational education; and while federal funding of vocational programs rose almost fivefold between 1962 and 1970, the rate of increase of state and local expenditures was even greater (Simon & Grant, 1973, p. 66). Currently, the widespread support and interest attending the concept "career education" is evidence that the momentum continues.

Unfortunately, a great deal of the decisionmaking which underlay this activity has occurred in the absence of adequate information. Questions of overwhelming importance, such as: "How can the educational system--broadly conceived--be best organized to serve individual and social objectives?" and "What are the consequences of current programs?" have been debated almost exclusively on philosophical and intuitive grounds. Only relatively recently have authorities began the tasks of systematic collection and careful analysis of data required to inform students, parents, school personnel and educational decisionmakers on these important issues. Fortunately, the first steps have been encouraging.

One hopeful sign is the diversity of these initial efforts. Educators, sociologists, psychologists and others who have traditionally pursued research in this important area have been joined by economists. The latter, influenced by the work of

Schultz, Becker, and others[1] relating to the theory of "human capital" have utilized such techniques as cost-benefit analysis to study the effectiveness and relative efficiency of education and training programs.[2] These efforts have broadened the base of educational research by conceiving programs as individual (or social) investments which potentially yield returns. Derived from the study of the allocation of scarce resources, this mode of inquiry is conceptually appropriate for evaluating secondary-level vocational education, where one may ask whether vocational programs, which are more expensive than nonvocational programs, produce results that are sufficient, on balance, to justify their continuance or to warrant their expansion. Several studies of this variety were concluded in the past decade.[3]

However, the relevance to policy of even this research has been circumscribed by limitations inherent in the design of many of the studies, or as a result of conceptual or methodological difficulties, often compounded--if not caused--by a lack of adequate data. Often confined to selected geographic areas, these studies have frequently been further limited by inappropriate choice of criterion variables, control groups, or control variables. Some, for example, have excluded relevant subgroups of former students, such as those who obtained postsecondary training. While this has presumably been done to study the "pure" effects of the high school program, it has had the unfortunate consequence of precluding examination of potential interactions between school and subsequent training. Moreover, national data indicate that the majority of high school graduates do pursue additional training or education.

Another limitation of past evaluative research in this field has been the lack of appropriate follow-up data. Issues relating to career attainment, lifetime earnings patterns, and similar employment-related criteria require longitudinal data on experience over the long run. At the same time, data from recent graduating classes are required to evaluate the impact of

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[1]See Becker (1962, 1964), Blaug (1970), Cohn (1972), Mincer (1962), Schultz (1962), Thurow (1970), and Weisbrod (1962).

[2]Hardin's review (1969) contains several illustrations.

[3]For reviews of studies which specifically address vocational education, see Little (1970), National Planning Association (1972), Stromsdorfer (1972), and Warmbrod (1968).

the 1963 and 1968 legislation. These conflicting needs, in combination with the relatively slow development of educational information systems,[4] has constrained the conduct of research.

Finally, many cost-benefit studies have been designed to attempt to assess ultimate success or failure in such a way that their results contribute little toward an understanding of either the process of secondary level education or the process whereby youth enter careers. As a consequence they are ill suited to guide decisions on how to improve existing programs.[5]

It is hoped that the final third of this century will bring improvement in the formulation of public policy on the education and training of youth. It is further hoped that the present study will make a modest contribution to this end by reviewing completed research and by extending and refining it with both improved data and methods of analysis.

The Present Study

In general, the empirical work in the present study compares graduates[6] from various high school curricula with respect to a wide variety of vocationally-relevant criteria, using data from a national sample of male youth. Specifically, the study seeks to determine the following: other things equal, how do youth from different high school programs compare with regard to (1) knowledge of occupations, (2) attitudes toward the adequacy of their preparation for work, (3) participation in post-school training and learning activities, (4) skill level, (5) wages, (6) unemployment experience, (7) job satisfaction, and (8) long run career prospects? Concerning wages, in addition to examining (a) starting rates of pay among graduates of the various programs,

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[4] A review of over 400 vocational programs indicates the inadequacy of most institutional evaluation systems (Hawkridge et al., 1970). A brighter picture is emerging; see Showalter (1974), Young et al. (1971), and especially Young (1973).

[5] See Stufflebeam et al. (1971, pp. 9-34) for a categorization of kinds of evaluation studies and a discussion of the utility of each approach.

[6] There are exceptions to the general statement above. For example, some analysis is conducted on data for those who are still students.

emphasis will be placed on (b) the response of wages to additional postsecondary training and (c) the rate of increase in wages over time as youth gain experience and become established in the world of work.

Data for the study are taken from the National Longitudinal Surveys, a research project sponsored by the Manpower Administration, U.S. Department of Labor, and conducted by the Bureau of the Census and the Center for Human Resource Research, The Ohio State University.[7] These data were collected in annual personal interviews between 1966 and 1969 with a national probability sample of over 5,000 males who were 14 to 24 years of age in 1966. Supplementing the data from these surveys are data collected in 1968 from a special mailed survey of the high schools attended by the youth. The NLS data base is a rich body of information on the personal and educational backgrounds of youth and permits the application of both cross-sectional and longitudinal research designs. In most cases, multiple regression will be used to control statistically for other characteristics of the youth to permit the assessment of the independent "effects" of high school curriculum.

Plan of the Volume

Chapter II opens with a review of the historical basis for the three major categories of school curricula at the secondary level--college preparatory, vocational, and general--including current thought on the role of each in preparing youth for careers. In addition, it contains a discussion of selected post-school opportunities for training and learning with specific reference to possible relationships between high school program of study and these post-school activities. The chapter ends with a short list of questions of debate where research can illuminate existing relationships.

Chapter III is a review of previous research in this field, including cost-benefit evaluations of vocational education at the secondary level. While this study is not cast in the framework of cost-benefit analysis, many aspects of that approach are relevant. Particular emphasis is placed on the conceptual and methodological limitations of past studies which circumscribe the applicability of their findings to the design of future policy.

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[7]For a description of the National Longitudinal Surveys project, see Center for Human Resource Research (1973).

Chapter IV presents a description of the data base used in the empirical work and outlines the hypotheses and the research strategy. Empirical findings of the study are presented in Chapter V, while in the final chapter various policy implications are drawn from the results.

CHAPTER II

CONCEPTUAL FRAMEWORK

This chapter presents the conceptual basis of our study of educational programs for career preparation of youth, building the framework in several steps. First, historical aspects of American educational philosophy which have contributed to the development of the current system of secondary-level education are reviewed. We then examine selected objective characteristics of the current system of secondary-level education in preparation for a review of contemporary debate on the relative effectiveness of each curriculum in achieving various objectives. Throughout, the major divisions of study--the vocational, college preparatory, and general programs--are conceived to embody major elements of educational policy at the high school level.

It is also necessary to consider the career relevance of selected post-school training and learning opportunities which are presently available to youth, with particular attention to possible relationships between the high school program and these opportunities. Specifically, we consider whether the later modes of preparation are conceivably substitutes for, or complements to, the school experience.

Finally, the chapter summary introduces specific research questions that are to be pursued, establishing a context for the final chapter in which policy implications are drawn from the findings.

An Historical Review

The several major programs of high school study are characterized in a diverse, wide-ranging literature. Even a casual survey, however, discloses sharp disagreement regarding the relative effectiveness of each curriculum in achieving various objectives. None of the three major programs--vocational, college preparatory, or general--has escaped the charge of being too narrow, or insufficiently relevant to certain goals or to the needs of certain students. In fact, the purposes and programs of secondary-level education have been the subject of long-standing debate.

To begin, it appears that what may be called the Vocational Education Debate can be traced to colonial times. By and large,

educational institutions in the colonies reflected a traditional, academic orientation conditioned by substantial religious influence. Early American grammar schools focused on instruction in Latin; "grammar school masters in the colonies . . . raised their voice against the demand that they should teach little children their ABC" (Brown, 1902, p. 134). Indeed, one early English writer warned of too great attention to the study of writing and arithmetic: "some may with reason fear it is by many perverted from its noblest end . . . [and employed] in a manner wholly to the service of secular advantage" (Brown, 1902, p. 27).

In the same era there were many who promoted substantial expansion of educational programs. In 1849 Benjamin Franklin proposed an academy where:

> It would be well if [pupils] could be taught everything that is useful and everything that is ornamental . . . that [pupils] learn those things that are likely to be most useful . . . regard being had to the several professions for which they are intended (Brown, 1902, p. 180).

Following American independence, Thomas Jefferson and others supported further development of the educational system because the conduct of both public and private affairs required a knowledgeable, law-abiding and law-making citizenry (Educational Policies Commission, 1937, pp. 22-24; Kaulfers, 1966, pp. 4-5). The needs of the new democracy were frequently cited in proposals for the formation of academies during the 1800's. As a consequence, their curricula were characterized by diversity of subjects, where studies of "the speculative and liberal interest ran alongside of the consideration of practical use" (Brown, 1902, p. 233). However, "that part which looked to preparation for college was . . . fairly well defined in the tradition received from the grammar schools" (pp. 236-237), and one might add as well that the latter part bulked large.

The system of academies formed around the early 1800's became the earliest precurser to modern secondary-level education (pp. 222-227). These institutions, which were often endowed, sectarian schools, were later supplanted by the establishment of secular, free public high schools. The "need" for institutional responsiveness again played a major role; one of the earliest public schools in Boston was proposed in part on the grounds that:

> A parent who wishes to give a child an education that shall fit him for active life, shall serve as a foundation for eminence in his profession, whether Mercantile or Mechanical, is under the necessity of giving him a different education from any which our public [grammar] schools can now furnish (Brown, 1902, p. 299).

The end of the nineteenth century and the beginning of the twentieth saw not only the onset of industrialization but a reformulation and reemphasis of the purposes of education. The major educational statements of that time included the following:

> The course of study is laid down with a view to giving the pupil . . . the means of directive power and of further self education . . . [that is, both] immediate mastery over the material world [and] the initiation into . . . association with one's fellow-men (Bureau of Education, 1874, pp. 14-15).

> The secondary schools of the United States, taken as a whole, do not exist for the purpose of preparing boys and girls for colleges . . . Their main function is to prepare for the duties of life (Committee of Ten, 1894, p. 51).

> The great end of education is to create productive ability (Committee of Ten, 1894, p. 213).

> Education in a democracy, both within and without the school, should develop in each individual the knowledge, interests, ideals, habits and powers whereby he will find his place and use that place to shape both himself and society toward ever nobler ends (Commission on the Reorganization of Secondary Education, 1918, p. 3).

By the end of the first third of the twentieth century, acceptance of the multiplicity of educational goals had been demonstrated by the rise of the comprehensive high school, and fully half of the population 17 years old were graduating from high school. By 1940 over two-thirds of the high school age group was in school (Coleman et al., 1974, p. 26), and the trend toward universal secondary education has continued to the present time.

These years were not without debate. Cubberley (1909), while recognizing the interrelationship between studies of a fundamental

sort and the needs and problems of "our social, civic, and industrial life" (p. 66), proposed a specialization of educational functions:

> Our city schools will soon be forced to give up the exceedingly democratic idea that all are equal, and that our society is devoid of classes . . . and to begin a specialization of educational effort along many new lines in an attempt better to adapt the school to the needs of these many classes in the city life . . . Vocational schools and special type schools of many kinds are likely soon to find a place (pp. 56-58).

On the other hand, the commission responsible for the Cardinal Principles of Secondary Education wrote:

> This commission enters its protest against any and all plans, however well intended, which are in danger of divorcing vocation and civic-social education (Commission on the Reorganization of Secondary Schools, 1918, p. 10).

This commission preferred a developmental staging of fundamental, general and vocational studies (p. 12).

In a third vein, John Dewey argued for a "philosophy of unity" (1902, p. 18). He wished to reject the position that there are many distinct goals of education and proposed instead the view that education is a goal in itself (1916, p. 60). He wished to reject the view that there are differences between general training and specialized training[1] or that there is a conflict between cultural studies and utilitarian studies (1916, p. 298); Dewey called these "artificial" dualisms (1916, p. 422). At its limit, Dewey's position holds that "the only adequate training for occupations is through occupations" (1916, p. 362); when approached in this light, there is no inherent conflict among apparently diverse studies. "Isolated, [the various studies] may be chargeable with the defects of which they are accused. But they are convicted in this respect only because they have been first condemned to isolation" (1902, p. 77).

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[1] "The assumption that a training is good in general just in the degree to which it is good for nothing in particular is one for which it would be difficult to find any adequate philosophic ground" (1902, p. 96).

The preceding three opinions appear to agree, in general, that educational purpose and program are best addressed holistically, but appear to disagree on the means of operationalizing instruction: in one case through specialization, in another through a time-ordering, and in the third through a unified approach to every course and every level. The diversity of thought represented here is also found in current literature on the major curricula. Indeed, the review of contemporary criticism that follows is organized along these three conceptions with one additional distinction: it is necessary to differentiate within current thought between criticism of purpose and debate concerning program. As will be shown, some of the debate about extant vocational programs is primarily a question of legitimacy--the rejection of "training" as entirely inappropriate to "education"--while other criticism stems from operational policies in such programs and strategies of implementation. However, before proceeding to current debate, data describing several objective characteristics of the different curricula and their enrollees are presented.

The Current System

The most common vehicle for American secondary education is the comprehensive high school, which offers programs in three major groups: the general, college preparatory and vocational curricula. The general curriculum is typically comprised of "several courses in English literature and composition, mathematics, physical education, history, and the physical sciences... [and optional courses in] art, music, foreign languages, psychology or sociology" (U.S. Department of Health, Education and Welfare, 1973, p. 37). In addition, those in the general track may often take courses in the practical arts (i.e., industrial arts such as woodworking, metalworking and drawing; business education, especially typing; etc.).

By comparison, the program of the college preparatory curriculum typically covers the same subject areas but does so through courses more advanced than those within the general curriculum. Lastly, the vocational curriculum is itself an aggregation of distinct specialty programs, including agriculture, auto body and automobile mechanics, various construction and industrial trades (frequently called Trades and Industry), distributive and office specialties, and other less common programs such as health technologies and airplane mechanics (Simon & Grant, 1973, p. 43).

It is important to recognize that the "vocational curriculum" is not to be construed as being coextensive with the set of programs funded by the federal government under vocational education legislation. Nearly half of total enrollments under

the latter are in non-secondary programs, and two-fifths of the remaining enrollment consists of girls in home economics courses (p. 43). Moreover, since the federal share of total expenditures on vocational and technical education has rarely exceeded one-fifth since the early 1950's (p. 66), the "vocational curriculum" in the offerings of secondary schools is often designed and funded principally by state or local sources.

Nationwide estimates of the size and distribution of secondary-level enrollments are available from several surveys of youth.[2] Project Talent data (Flanagan et al., 1964, p. 5-11) indicate that half of the 1960 12th-grade males were enrolled in the college preparatory curriculum (48.2 percent), one-fourth were enrolled in the general curriculum (24.8 percent), and the remainder were distributed across vocational trades and industry (12.4 percent), commercial (7.1 percent), agricultural (4.1 percent) and other programs (3.4 percent). These figures agree in the main with those from other surveys.[3]

Data from national surveys also indicate substantial movement across curricula by youth during their high school years. Reports from Youth in Transition note that a majority of seniors in both vocational and commercial programs had transferred from other programs (Bachman, 1972, p. 26). In addition, Project Talent reported: "a substantial fraction of the top 10 percent in general academic aptitude fail to select a college-preparatory course when they enter high school. In most cases the high schools are successful in identifying and transferring to the college-preparatory course a large proportion of these students . . ." (Flanagan & Cooley, 1965, p. 1-5).

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[2]The necessity to rely on survey data arises at least in part because of inadequacies in past U.S. Office of Education reports (Evans, Mangum & Pragan, 1969, pp. 37-39).

[3]The same relative ranking is reported by Bachman (1972); and Coleman reported that 13 percent of Fall, 1965, 12th graders of both sexes were enrolled in vocational programs, with higher percentages reporting having taken at least one vocational course (17 percent of whites, 22 percent of Negroes). Moreover, 90 to 95 percent of the secondary schools attended by students in Coleman's sample offered a college preparatory, commercial, and general curriculum, while only 55 percent and 27 percent offered vocational and agricultural programs, respectively (Coleman et al., 1966, pp. 545-547 and p. 94).

High school dropout rates are also reported to differ by curriculum.[4] Thus, estimates of the distribution of enrollments by curriculum are found to vary; figures based on graduates differ from those based on current enrollments, which in turn depend on the specific years of high school covered. Data from the National Longitudinal Surveys (Table 1) illustrate these variations in distribution among various groups.

Descriptive data on enrollments make it clear that there are substantial differences in the characteristics of students entering the different programs. On average, students in vocational programs are from families in the lower socioeconomic levels and score lower on standardized tests than do students in other curricula (Table 2). Moreover, there are striking differences in the patterns of post-school activities of the youth, which suggest the possibility of additional differentiating characteristics in aspirations, motivation, and other factors (Table 3). Indeed, many have expressed concern over the social segregation of students which accompanies curricular segregation, particularly in the case of specialized vocational institutions (Conant, 1967, pp. 4-5; Evans & Galloway, 1973, p. 34; Grambs, 1966, pp. 88-92).

Current Debate

This review of contemporary thought will proceed in line with the concepts introduced earlier: (1) developmental staging of studies in time-sequence, (2) segregation and specialization in program, and (3) a unified approach to every course at every level.

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[4] For a discussion of dropout rates, see Coombs and Cooley (1968). The net effects of both movement and early leaving in regard to the vocational trade and industry track can be inferred by comparing the distribution of 9th-grade males in such programs with the distribution of 12th-grade males: while one third of 9th graders in such programs were above the 50th percentile in academic aptitude, this was true of only one-fifth of 12th graders (Flanagan & Cooley, 1965, p. E-2).

Both the transfer rate and the distribution by academic aptitude which are reported here are in apparent conflict with reports by Evans and Galloway (1973), who used Project Talent data. Personal correspondence with one of the authors has revealed that the aggregation of three groups of vocational graduates (trade and industry, commercial, and agricultural) as compared to the separate analysis of the vocational trade and industry group, which produced the figures given above, is the source of the disparity.

Table 1

High School Curriculum by Educational Status and Race: Males 14-24 in 1966

Educational status in 1966	Weighted n (in thousands)[a]	Percentage distribution[b] Vocational	Commercial	College preparatory	General
Whites					
Enrolled in high school	5,142	9%	3	43	45
Grade 9	840	5	2	36	57
Grade 10	1,493	8	2	43	48
Grade 11	1,475	12	4	43	42
Grade 12	1,315	11	3	48	39
High school graduates enrolled in college	3,020	3	1	70	26
Undergraduate	2,704	3	1	69	27
In graduate school	317	0	1	83	16
High school dropouts	1,159	9	4	6	82
Completed grade 9	307	4	3	3	91
Completed grade 10	430	10	1	2	87
Completed grade 11	422	12	6	12	70
High school graduates, not in school in 1966	3,442	13	5	31	52
High school only	2,514	16	6	20	59
Some college	596	6	2	52	39
College graduate	332	0	2	76	22
All out of high school[c]	7,621	8	3	43	46
Blacks					
Enrolled in high school	709	14%	4	21	61
Grade 9	153	6	3	9	82
Grade 10	212	13	5	18	64
Grade 11	195	18	4	31	48
Grade 12	147	18	6	26	50
High school graduates enrolled in college	151	7	2	47	44
Undergraduate	148	7	2	48	43
In graduate school	4	0	0	33	67
High school dropouts	304	14	4	6	76
Completed grade 9	75	20	2	0	78
Completed grade 10	121	13	7	5	76
Completed grade 11	107	13	2	10	75
High school graduates, not in school in 1966	389	14	3	18	65
High school only	323	17	3	11	70
Some college	45	3	6	50	42
College graduate	21	0	0	62	38
All out of high school[c]	858	13	3	18	64

Source: National Longitudinal Surveys data.

[a]Excludes those for whom current (or last) curriculum was not ascertained. Components may not add to subtotal due to rounding.

[b]Percentages may not total 100 percent due to rounding.

[c]Comprised of high school graduates (enrolled and not enrolled) and high school dropouts.

Table 2

Distribution of Students on Academic Aptitude for Selected High School Programs of Study: Project Talent Sample of 1960 Ninth-Grade Males

	High school curriculum				
	College preparatory	General	Commercial or business	Vocational (trade and industry)	Agriculture
Percent of students					
Above 90th percentile	19.5	5.5	2.9	1.9	3.4
Above 80th percentile	37.1	12.4	5.8	4.6	6.5
Above 70th percentile	51.2	22.4	10.8	11.4	12.1
Above 60th percentile	63.9	31.4	16.4	19.9	21.5
Above 50th percentile	72.4	44.4	23.4	33.3	31.1
Above 40th percentile	80.9	56.5	35.1	43.8	40.4
Above 30th percentile	86.9	69.8	48.1	56.7	54.4
Above 20th percentile	91.2	81.1	65.4	67.6	69.7
Above 10th percentile	96.1	89.3	78.6	85.1	87.0
Above 0th percentile	100.0	100.0	100.0	100.0	100.0

Source: Flanagan et al., 1964, p. E-2.

Table 3

Activities Five Years After High School for Selected High School Curricula: Project Talent Sample of 1960 Twelfth-Grade Males

	High school curriculum				
	College preparatory	General	Commercial or business	Vocational (trade and industry)	Agriculture
Percent who neither went to college nor received post high school training	3.9	24.8	22.3	32.1	39.0
Percent who went to college	87.5	39.5	43.0	21.5	28.5
Of those not going to college, percent who received training	69.2	59.0	61.0	59.1	45.5
Of those going to college, percent who received Baccalaureate within five years	58.7	29.8	28.4	13.0	34.3

Source: Flanagan et al., 1971, p. 11-14.

Staging

Disagreements on the first concept revolve largely on the compatibility existing between the stages of the career development process and the time- and grade-sequencing of high school programs. That is, while "career choice" is best described as a developmental sequence which unfolds over a period of time, curricular choice is necessarily encountered in the early years of high school.

The potential consequences of a disparity between the stages suggested by development theory and the elements of educational practice have received particular attention in connection with vocational programs. It is recognized that the early choice[5] of a vocational program, indeed a selected vocational specialty, has substantial career implications because it may constrict later options. A national advisory panel which urged support for vocational education nonetheless had this to say:

> Vocational education cannot be meaningfully limited to the skills necessary for a particular occupation. It is more appropriately defined as all of those aspects of educational experience which help a person to discover his talents, to relate them to the world of work, to choose an occupation, and to refine his talents and use them successfully in employment. In fact, orientation and assistance in vocational choice may often be more valid determinants of employment success, and, therefore, more profitable uses of educational funds, than specific skill training [Emphasis added] (Evans, Mangum & Pragan, 1969, p. 63).

Unfortunately, existing evidence on this score is not encouraging. Venn has pointed out that:

> Sound career choice is made in direct proportion to the information, exploration, guidance and opportunity available to the individual to prepare, and assistance given him for entry placement in a

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[5]Lewis (1968) relates that most theories of vocational choice agree "that the average young person does not have sufficient maturity in the ninth or tenth grade of high school to select a particular vocational area for specialization" (pp. 30-31). For a more thorough discussion, see Bailey and Stadt (1973, pp. 57-94).

> job . . . A recent survey showed only 19 percent of high school seniors felt they knew as much about jobs as they would like to know. For too long, choice of occupation and preparation for career development has been left primarily to chance (1970, p. 238).

Other research on the career plans of high school students confirms this view. Project Talent data indicate that only 31.4 percent of male high school students had the same career plans one year after high school as in the twelfth grade.[6] The same researchers found "no strong tendency for students leaving a particular career [choice] to move to a closely related career. Rather, students leaving all careers seem to choose new careers in accordance with the overall popularity of various occupations" (Flanagan et al., 1971, p. 3-13). Elsewhere they concluded that "students have been faced with choices they were not adequately prepared to make" (Flanagan & Cooley, 1965, p. 1-6).

Horowitz and Herrnstadt, in a study of machine shop programs in Boston schools, have pointed to one possible cause of the problem:

> One-half of the high schools surveyed had no full time counselor or had one who concentrated on college preparatory students . . . The schools generally had a limited influence on the occupational decisions of machine shop majors. These students either had made up their minds before entering high school or had accepted the program in which they were placed, expecting to find a job after graduation . . . Nearly half the seniors really wanted to do something completely alien to metal working. Only a third really wanted to be a machinist or a tool and die maker (Manpower Administration, 1970, p. 12).

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[6] Corresponding percentages for the eleventh, tenth, and ninth grades were: 25.0 percent, 18.9 percent, and 16.8 percent, respectively. Since the percentage with "same plans" is at least partly determined by the classification scheme used, it is noteworthy that the figures cited originated with a 31-category occupational grouping system. When a 6-category scheme was used, the percentage of agreement between ninth grade plans and one year after graduation rose, as expected, but only to 42 percent (Flanagan & Cooley, 1966, pp. 177, 183).

In short, the vocational program of study has been criticized because students must choose too early on the basis of too little information and with inadequate vocational guidance. Even so, critics do not necessarily condemn the principle of "staging," for many object solely to the present timing of choice and recommend instead that the period of specialization be delayed until after the high school years.

On the other hand, some believe the high school years to be the appropriate time. They argue that greater attention to occupational matters in elementary schools, combined with improvement in guidance, will suffice. Moreover, it is argued that such steps are required to serve the many youth who discontinue formal education with high school.[7] The difference between these approaches appears to lie in the extent to which writers believe that the development process can be hastened to fit the timing of our school systems.

Specialization

The second major focus of current debate involves the concept of specialization. It should be noted that what is "specialized" to one writer may be considered "general" to another and "unwisely over-specialized" to still a third. Thus, where possible, relevant definitions are included.[8]

It is useful to begin with Conant's view of the purpose of the comprehensive high school:

> It endeavors to provide a general education for all future citizens on the basis of a common democratic understanding; and it seeks to provide

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[7] On this point, see Marland (U.S. Office of Education, 1973, pp. 7-8). However, the virtual explosion of new literature in the realm of Career Education includes much exciting and provocative thought on life-long learning (Bailey & Stadt, 1973, pp. 289-295; Evans, Hoyt & Mangum, 1973, pp. 10-15). Its future impact on secondary-school programs is yet unknown.

[8] At a 1966 conference on research and vocational and technical education, Morrison and Frantz presented proposals for improving occupational education. The proceedings are instructive in the extent of disagreement between presenters and discussants in defining general and specialized education (Quirk & Sheehan, 1967, pp. 57-82, 83-94, 95, 187).

> in its elective offerings excellent instruction in academic fields and rewarding, first-class vocational offerings (1967, p. 4).

This view categorizes as general those studies which are apparently advantageous for all students, and as specialized those which are elected for individual needs.[9]

This definition qualifies college preparatory studies as specialized education, and such programs have indeed been criticized for narrowness. Evans, for example, states that the "most prestigious" program, the college preparatory course:

> Enrolls about half of the students . . . spends very little time on general education but unabashedly aims toward one goal, success in the type of college which leads to graduate school . . . It is undoubtedly successful in achieving its limited goals . . . however, this education does not meet the demands of all or even a majority of the students who attend high school (Princeton Manpower Symposium, 1969, pp. 191-192).

Others who point to high rates of noncompletion of college and to excesses in the supply of college graduates in certain fields, have questioned the wisdom of large enrollments in this track.

Clearly the program which is most criticized on grounds of specialization (over-specialization, misguided specialization, and the like) is the vocational track. There is continuing debate on the propriety of including specialized vocational training in the educational system.

For example, Ditlow has cited a distinction by Keats:

> It would help to clear the air if we immediately distinguished between the terms education and training . . . Education is concerned with concepts rather than with vocational techniques . . . On the other hand, specific instruction in the mysteries of law, embalming, plumbing, medicine, holy orders, and business administration is vocational training. It has nothing to do with education (Ditlow, 1970, p. 285).

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[9]Other bases for distinguishing general and specific education, or training, or skills, can be found in Glaser and Glanzer (1958, p. 9), and Becker (1964, pp. 11-36).

Ditlow continues:

> "Occupational training" is too narrow a concept to be taught as a course or series of courses relevant to changing technologies. Educators must truly identify and distinguish between occupational education and training. The schools should educate through the general education programs. Industry and special technical schools should train for specific skills (p. 287).[10]

In addition, some suggest that specialized training is competitive with, and perhaps detrimental to, achieving other general objectives. For example, Grant Venn of the Office of Education has stated:

> Vocational education has a dual purpose: to provide the people it serves with an education and to train skilled workers for the labor force. The fact that the program often does neither of these things well had made its acceptance by industry and education all too often lukewarm. The high degree of specialization found in many vocational and technical curriculum appears to be misguided . . . What is called for is more and better occupational education on a more general basis - devoting more time to the development of broader technical understanding, of communication and computational abilities, and of appreciation of civic, cultural, and leisure activities . . . (1970, pp. 60-61).

A similar view was expressed by Project Talent researchers who examined the relationship between course work and students' achievement scores:

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[10]A similar point was made by the Panel on Youth of the President's Science Advisory Committee (Coleman et al., 1974, pp. 141-143). This latter group did not, however, conclude that schools have no role to play in vocational education, for the Panel applauded "cooperative education" programs, where the student splits his time between classwork and a job carefully selected for its learning potential. Such programs qualify as federally-reimbursable under existing vocational education legislation, and while the size of these enrollments is still relatively small, Evans points out that it exceeds that of formal apprenticeship programs (Princeton Manpower Symposium, 1968, p. 8).

> At the present time many poor students who are just barely able to read are placed in vocational training courses that give little emphasis to reading and basic skills. It is probable that a large proportion of these students do not end up with skills that make them attractive to employers . . . It is possible that placing such students in a general curriculum and raising their basic literacy slightly might do more to maximize their employability . . . (Flanagan et al., 1962, p. 4-22).

Lastly, some have questioned the adequacy and emphasis of the "most specific" aspect of the vocational curriculum--specialized vocational training. Assessing the relevance to market demands of the composition of vocational programs, Somers has called the vocational education system "sluggish" in responding to the changing labor market (1968, p. 58). Horowitz and Herrnstadt were even more critical when they found that:

> The majority of high schools . . . lacked community support, and many of their students did not obtain the better jobs that were available. For routine machine shop work, employers preferred high school students with desirable attributes who had no vocational training over vocational students from programs and schools with poor reputations. In such cases, a youth's skill was considered less important than his attitudes, work habits, and his long run potential (Manpower Administration, 1970, p. 12).

Taussig's research led to the same conclusion:

> The evidence presently available points to the conclusion that the direct market benefits from high school vocational education in New York City have been disappointing . . . One important factor . . . appears to be the irrelevance of the school's criteria for what constitutes a successful program . . . Few people will argue with the proposition that large, high-wage firms in the city ignore formal trade training in the schools in favor of setting requirements such as high verbal aptitude for entry jobs and then train and promote workers within the internal labor market (1968, pp. 77, 84-85).

Taken together, these statements express concern over the propriety of specialization, noting that--to be optimally effective--the specialized program must "fit" both the student and the labor market. In the latter case this includes the "right" job clusters,[11] and within each the "right" kind of training.[12] Anything less, it is held, runs the risk of serving neither very well.

On the other hand, proponents of vocational education argue that specialized skill development is not only appropriate for secondary education, but necessary for youth. Frequently, such arguments include the suggestion that high unemployment and other labor market problems of youth are the results of low secondary-level vocational enrollments (Marland, 1971a & 1971b).

In addition, proponents argue that a properly-designed vocational program can contribute positively to academic goals:

> Relating formal, planned instruction to the life-career roles of students will help bring about a marriage between "academic" and "vocational" programs and will help students find a new significance in learning, thus motivating them as so-called academic courses never could do (Parnell, 1971, p. 102).

One additional, very important view on the question of specialization focuses on "specialization for what" and appears in connection with the Plan Europe 2000 project. The major point of departure lies in emphatic rejection of a commonly accepted assumption: namely, that the needs of the current socio-eco-political environment constitute an appropriate basis for educational decisionmaking. In contrast, Plan Europe 2000 is an attempt to consider both a desirable future environment and a means by which this future can be achieved:

> An increasing awareness of the potential or ideal goals is essential in a truly new education, which should begin very soon for

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[11] See Young (1973) for the report of a conference on educational planning with reference to market demand.

[12] Bowman points out that curricular variations may be of greatest interest in educational decision-making (Schaefer & Kaufman, 1971b, p. 87).

> we are already educating those who will be called upon to create the society of the year 2000. It is worthy of note that Dewey, precisely when discussing vocational education, after warning us against the danger of interpreting it as "an instrument for maintaining unchanged the present industrial order of society," had stated the need to develop within the school "a projection of the type of society that we would like to bring about," thus forming minds that will later be able to put society on its proper path (Visalberghi, 1973, p. 121).

Unified Instruction

The concept of "unity" in instruction, where every unit of study is designed comprehensively, is still best expressed by Dewey. "Any fact is general if we use it to give meaning to a new experience" (1916, p. 399). The general curriculum is claimed by some to accomplish this very end, particularly within the practical arts where primary emphasis is placed on the development of understanding of technology in the modern world.

Perhaps one of the clearest statements of the theoretical distinction between the practical arts and vocational education was made by DeVore:

> Those in education are thus faced with a decision. Shall technology serve man or will man be forced to be a cog in the machine. If the assumption that the function of education is to prepare men and women for the world of work is accepted as true, this indicates the latter choice. The opportunity to reconsider this choice is still available. It is a value judgment involving two choices. (1) Continue to plan educational programs to meet short term occupational and economic goals; or (2) Change the curriculum and focus on long term goals based on the vision of man and his purpose . . . In the existentialist sense of the term, it is a quest for meaning in a highly complex technological society; a society which is more and more directed by the ambivalent phenomena of technology itself. Jacques Ellul points out . . . that man is no longer in control of his destiny; technology is (1969, pp. 7-9).

Hammond (1969) describes the new Industrial Arts Curriculum Project, developed by The Ohio State University and the University of Illinois, as one which "hopefully . . . will cut across all levels of interest in any given class and will permit each student to relate in his own way to that portion of the course which interests him . . . This will be effective preparation for apprenticeships" (pp. 58-59). Significantly, this author also cites Morris: ". . . when vocational school graduates in our major cities are not typically able to pass even equitably administered apprenticeship tests in trades they have studied for three years, no one [can] conclude that all is well" (p. 60).

However, this view of the general curriculum is by no means universally held. Marland has attacked this program as:

> A fallacious compromise between the true academic liberal arts and the true vocational offerings. It is made up, as its name suggests, of generalized courses, possessing neither the practicality and reality of vocational courses nor the quality of college preparatory offerings. Watered-down mathematics, easier English - such is the bland diet offered in the name of the general curriculum (1971b, p. 6).

Indeed, advocates of Career Education have called for the abolishment of the general curriculum (Evans, Mangum & Pragan, 1969, p. 47).

Even within the practical arts area, there is criticism. Evans remarks:

> One phase of general education has claimed to maintain its contact with life outside the school. The most frequently offered of these so-called practical arts are: industrial arts (shop or manual training), homemaking (home economics or domestic science), business education (especially typing), and driver education . . . It is difficult to characterize these practical arts as subjects. Industrial arts, for example, often consists of instruction about processes common in industry two hundred years ago, taught on equipment invented one hundred years ago (Princeton Manpower Symposium, 1968, p. 195).

In sum, these debates present a complex conceptual terrain for forming hypotheses about the comparative contribution to career preparation of the several high school curricula. More

importantly, the existing differences of opinion underscore the need for well-designed research to produce relevant empirical evidence. Before attempting a synthesis, however, it is necessary to consider one other highly-related "system," namely, post-school learning and training opportunities available to youth.

Post-School Training and Learning

Other institutions performing supplementary roles in preparing youth for careers can be grouped into (1) formal programs, (2) informal means, and (3) programs involving a combination of formal and informal means. In the first group are such post-secondary training programs[13] as private and public business and technical schools or junior colleges which may offer degrees or certificates for programs typically lasting up to two years. In the second group are instances of informal learning experiences and on-the-job training which occur in the context of actual employment. These are particularly evident during the early years of labor market exposure and are often part of the process of job sampling as young workers become acquainted with diversity in the world of work. Included in the third group are experiences which are a mix of learning, training and application, such as apprenticeships, jobs involving company-sponsored training schools, and some cases of military service.[14] In the aggregate, these various means represent an impressive resource for youth.[15]

A 1963 Department of Labor survey (Manpower Administration, 1964) of the education and training backgrounds of adults in the labor force provides baseline information on the connection between education, training, and experiential learning on the one

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[13] Excluded for current purposes is college or university work leading to four-year degrees.

[14] Presumably excluded are those where the training and experience are of a combat nature or otherwise unrelated to subsequent civilian career patterns.

[15] The Project Talent follow-up of eleventh graders (Flanagan & Cooley, 1965) found that "high school is becoming a terminal experience for only a minority of the students. Well over half of them went on to further schooling in colleges, junior colleges, technical institutes, schools of nursing, business schools, and other such institutions"(p. 1-5).

hand and occupational assignment on the other. One of the most noteworthy findings was that a clear relationship between preparation and occupation prevails in relatively few occupational categories.

Fully two-thirds of all the reported formal training had been undertaken before age 25; half before age 18. Thus, much of the reported formal training was associated with schools; training attributed to high schools alone accounted for over a third of all instances of formal training. Nonetheless, a not inconsequential amount of formal training was reported in progress[16] at the time of the survey, especially for professional, technical and kindred occupations and for craftsmen, foremen and kindred workers. Moreover, the data underscore the importance of on-the-job[17] and more casual methods of occupational preparation, which apparently play an important role through a worker's entire career.

The complexity of training patterns is illustrated by the backgrounds of construction craftsmen. When asked to indicate the ways their job was learned, almost two-fifths cited formal programs: apprenticeships, high schools, out-of-school programs, special schools, and armed forces training. Nevertheless, when asked to name the most helpful way of learning their current jobs, the preponderance cited "on-the-job instruction," "just picked it up," and "learned from friend or relative." Only 4.3 percent and 11.0 percent responded that schools and apprenticeship programs, respectively, were the most helpful way (Table 11, p. 43).

A more recent study specific to the construction trades in upstate New York further illustrates the complexity of training paths in this industry. Of 784 respondents, 280 were at one end of the continuum in having obtained their skill training through apprenticeship, while 169 were at the other end, having "picked it up on the job," including learning while in unskilled occupations. Additional sources of relevant training were

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[16] In exploring participation rates in post-secondary education and training, the Carnegie Commission on Higher Education found that in 1969 and in 1972 over 10 percent of the adult out-of-school population had reported participating in various programs annually (1973, p. 27).

[17] This does not include apprenticeship, which was categorized as formal training.

nonunion work experience (almost half of all respondents acknowledged this), experience in other industries, military experience, informal instruction by friends and relatives, and formal schooling including vocational education. Of particular interest to our study is an observation by the author of this report:

> The point here is by no means that in-school vocational education is a useless form of training, but rather that in current practice it often does not complete the worker's training, that it usually must later be combined with other avenues of skill acquisition . . . Although some vocational education was reported by a significant number of respondents, this appeared to be only a short first step in the development of construction skills (Foster, 1970, p. 25).

Another study of six construction trades in nine large cities was designed to compare apprenticeship and other sources of training with regard to (1) ascension to supervisory positions and (2) annual hours worked. The findings provide additional though limited support in favor of apprenticeship training (Marshall et al., 1973). Interestingly, within this sample, it was found that only a small minority of the nonapprenticeship group had formal training prior to union entry: 15 percent had no previous training, 35 percent were formerly laborers or helpers, and another 35 percent reported on-the-job training in open shops; less than 15 percent reported either vocational schooling or the military (Table 38, p. 111).

The emphasis given here to certain skilled blue collar occupations should certainly not be construed to suggest that this is the only occupational category relevant to youth embarking on careers. Quite the contrary, skilled blue collar workers in total comprise only a small fraction of the labor force. Nonetheless, this relatively clearly-defined group requires skills at entry which may be obtained in a variety of ways either instead of or in addition to formal training at the high school level.[18]

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[18] Other studies which address other occupational categories have arrived at similar conclusions, underscoring that training at the high school level is only one of many facets of the career development process. See, for example, Bergstrom (1966), Brecher (1972), Freedman (1968), and Garbin et al. (1970).

High school vocational programs may provide skills that students in other curricula do not obtain except through further investments of personal or social resources. When similar skill-development programs are offered in public institutions for both in-school (secondary) and out-of-school youth, or are offered both at the secondary and post-secondary (community college) level, and by industry or in apprenticeships, these alternative sources--which are seemingly substitutes for one another--may not necessarily be equally efficient from either the individual or social point of view. Moreover, the post-school programs may tend to serve different populations than the in-school programs, particularly when career interests coalesce only after additional exploration or actual job experience.

But skill development programs at the secondary level may be complementary to the post-school programs. This would occur, first, if the high school program in question also develops the "ability to learn." Second, there may exist a division between initial preparation and subsequent opportunities for practical application. Such a view was expressed by Todd, who cites the medical student's internship and residency as periods of additional preparation which necessarily follow formal training and states that, analogously:

> The graduate from a vocational program may be aware of the fundamentals of a field, but he probably lacks some of the detailed pragmatic knowledge needed for particular jobs . . . For some kinds of learning, what is most needed may be further training and practice . . . [ranging] from the highly structured and formalized at one extreme . . . to the completely informal and unstructured learning by experience at the other extreme (1969, p. 66).

In this and other ways, participation in certain high school programs may lead to more or better future training opportunities, even if only because participation at the secondary level may be instrumental as a credential.

While some previous studies of the early career experience of youth have included data on the incidence of post-secondary training, the role of such training in the launching of youth on careers has often been neglected and even misunderstood. In one case, for example, the college preparatory curriculum was criticized as inadequate when it was found that graduates of this program who had not gone to college reported substantial

participation in post-school training programs.[19] By the same logic, one might have criticized that track on the basis of the high college entrance rates of its graduates, for in both cases graduates are "forced" to take additional preparation. Clearly, however, subsequent training and learning opportunities should be conceived as additional resources, which may serve as substitutes[20] for or complements to the high school program.

Moreover, the high school program may operate in different ways for individual specialties in various job markets. For example, Taussig suggests that firms which are able to train workers internally may discount or ignore training received elsewhere (1968, p. 85); union rules have been known to require vocational high school graduates to repeat in the apprenticeship program courses taken in school. On the other hand, from Corazzini's findings one might infer that smaller firms that are unable to provide internal training efficiently may pay a premium to potential employees who are already trained (1968, pp. 104-105).

Questions for Research

In summarizing the debates presented above, it is necessary to bear in mind the interrelationship between high school studies of various kinds. The following statement adequately expresses this point:

> It is no longer possible to compartmentalize education into general, academic and vocational components. Education is a crucial element in preparation for a successful working career at any level . . . The educational skills of spoken and written communication, computation, analytical techniques, knowledge of society and one's role in it, and skill in human relations are as vital as the skills of particular occupations. On the other hand, employability skills are equally

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[19] Kaufman et al. (1967, p. 6-36); a later report calls high post-secondary participation rates "encouraging" (Schaefer & Kaufman, 1971a, p. 51).

[20] Serving as substitutes they may (1) compensate for deficiencies of the program of study taken in school, (2) provide for students whose career interests crystallize after having left school, or (3) function in other ways. No a priori role need be identified.

> essential to education . . . Vocational education is not a separate discipline within education, but it is a basic objective of all education and must be a basic element of each person's education (Evans, Mangum & Pragan, 1969, pp. 61-62).

Granting this, however, does not logically preclude us from undertaking research on the various components individually. Educational systems can be improved with the aid of research designed to scrutinize selected dimensions to uncover important relationships in the operation of current systems.

As has been shown, one subject of current debate concerns the staging of studies at least somewhat in line with the development of career interests. One important prerequisite of a wise vocational choice is breadth and depth in a youth's general occupational information. We address this question empirically to determine the relationship, if any, between the several programs of study and scores on a general occupational information test.

A second major point of concern has been the degree to which specialized studies contribute to successful post-school experience. We attempt to illuminate this area in four ways. First we examine the degree to which former students of the various curricula report a felt need for additional training and education. Second, we review the actual participation of graduates in several types of post-school programs. Third, with the use of ratings of the varying skill requirements demanded by different occupations, we present evidence as to whether graduates of different programs are able, on average, to obtain more- or less-demanding jobs.

Finally, we empirically pursue the relative market effects of each program by observing graduates of the several curricula in their early years of labor market activity. A number of indicators are used as criterion measures, including wages (i.e., initial wages and the gradient of wages as graduates become established in the world of work), the incidence of unemployment experience, achieved occupational status, and the degree to which graduates report being satisfied with their jobs.

CHAPTER III

REVIEW OF PREVIOUS RESEARCH

This chapter consists of a survey of past research relevant to the empirical work of this study. It begins by considering the necessity for, and character of, "control" variables. Following this is a review of work which has previously used the same criterion measures. Lastly, a summary presents the specific research questions pursued empirically, noting differences between the present approach and previous work.

Control Variables

It was shown in the previous chapter that students in the several curricula differ on a number of important dimensions, particularly with respect to the socioeconomic level of family background and also in scholastic aptitude scores. Fundamental relationships underlie these differences.

First of all, measures of the latter two characteristics are themselves interrelated. Debate may continue on the degree to which aptitude and achievement scores are measures of genetic endowment as opposed to being environmentally determined. However, the test scores correlate with both the inherited and the environmentally-transmitted characteristics of the family of origin for such diverse reasons as the character of prenatal care, influence of the home environment, and provision of learning resources.

Moreover, all of these influence early career development and experience. The Panel on Youth of the President's Science Advisory Committee recognized the influence of the background of youth:

> In reports of youth or adults about the most important influences upon their vocational aims, parents receive the largest proportion of nominations, with the school, peers, relatives or other adults, and work experience being the others most frequently cited. Peer groups typically are composed of youngsters from homes of similar status and tend to reinforce familial values. Similarly, the parents' friends are of comparable socioeconomic status and interests. Family income helps to determine not only the likelihood of higher education, but also the

> place of residence and, hence, the caliber of lower school attended and the types of neighbors (Coleman et al., 1974, p. 105).

Thus, analysis directed at ascertaining the net effects of the different curricula must be careful to control for these factors. As explained below, the approach in this regard will be to (1) confine attention to high school graduates who do not attend college, (2) perform all analysis separately for white and black youth, and (3) within each group control statistically for background and aptitude by using measures of these variables within multiple linear regressions.

Occupational Information

Despite its obvious importance, the extent to which youth possess adequate occupational information has not been a subject of extensive research.[1] In one case, for example, a comparison was drawn between vocational students and students in the academic or general track both on their knowledge of occupations and on their perceptions of best jobs (Decker, 1967). Vocational graduates were found to know somewhat less about a variety of occupations and were more likely to name mechanic and other skilled trades as the best jobs they knew about. On the other hand, students in other curricula were more likely to cite as best jobs those in the professional, technical and managerial category. While such a finding suggests a broader perspective on the part of nonvocational students, the failure of the study to control for other factors makes it unwise to attribute the differences to the curricular per se.[2]

A number of important studies of occupational information have emerged from the National Longitudinal Surveys project. The first report in the series entitled Career Thresholds, for example, describes a number of relationships between a general

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[1] See Borow (1966), Shartle (1966) and Parnes (1974). For a look at the emergence of computer-based occupational information systems as aids to guidance, see O'Hara and Tiedeman (Somers & Little, 1971, pp. 63-99).

[2] Another previous study (Krasnow, 1968) includes data on high school curriculum, scholastic aptitude, socioeconomic status and occupational information. However, only gross relationships are presented; moreover, fairly substantial conceptual and methodological errors limit the usefulness of the work.

test of occupational information and the characteristics of male youth (Parnes et al., 1970, pp. 119-138). Positive associations were noted with age, grade in school, community size, availability of reading material in the home, and high school curriculum, among others; but none of these were expressions of net relationships.

In a later work, the results of multiple regression analysis were reported (Parnes & Kohen, 1975). Controlling for a variety of background characteristics including residence, aptitude, and socioeconomic level, the authors noted a strong net relationship between educational attainment and information. Perhaps more important, controlling for all these and several other factors, youth who did well on the test were found two years later in better and higher paying jobs. However, high school curriculum was not addressed. The current study proposes to do so by modifying and extending the previous work.

Adequacy of Preparation

Many studies have included material relating to the attitudes of students toward the program taken in high school. Vocational programs of various kinds have been compared to one another on the basis of graduates' ratings (Eninger, 1965, sections 6-8) and the degree to which the graduates obtain jobs related to their specialty area.[3]

Within the research that includes cross-curricular comparisons, Kaufman and Lewis (1968), for example, reported that "almost nine out of ten vocational graduates thought that their schools had made a real effort to prepare them for employment" (p. 72). While interpreting this as encouraging, they added that "it must be evaluated in the light of the six out of ten academic graduates who also felt that their schools had prepared them for employment" (p. 72). A study by Schaefer and Kaufman (1971a) found that only 39 percent of general curriculum graduates would recommend their program to younger students, while 77 and 87 percent of the vocational and academic students, respectively, would do so (pp. 38-39).

Our interest, however, centers on the relationships between school programs and subsequent training and learning opportunities,

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[3]Reubens points out that the evidence on placement is mixed, with the U.S. Office of Education reporting generally higher figures than most micro studies (1974, p. 24).

on the one hand, and between these sources of career preparation and jobs, on the other hand. Such questions have received somewhat less attention in the literature.[4]

To examine these relationships, we first compare the several curricula on the basis of (1) whether recent graduates desire additional education or training and, if so, what kind; and (2) the actual subsequent participation of graduates in post-school programs of many kinds. This approach may illuminate whether vocational graduates are less likely than others to feel such a need; if so, it would suggest that programs after high school serve largely as substitute sources of training which nonvocational students did not receive while in school.

As to the jobs which youth can obtain, Reubens' review of Bureau of Labor Statistics data from 1959 to 1972 "suggests there is a limited demand for skilled high school graduates . . . [and] it is only after being out of high school several years that young men make sizable shifts toward more skilled occupations" (1974, p. 29). While others have reported generally similar findings in the aggregate, it is by no means clear whether differences exist among youth from different high school programs. The major obstacle to research on this question has been the lack of appropriate criterion measures.[5]

However, by capitalizing on the recent work of an economist who has studied the change in job content for the U.S. economy as a whole, we can now assign ratings to jobs according to the skill level required for "normal performance." By evaluating the skill levels of the first jobs obtained by youth after leaving high school--as well as subsequent jobs--we can ascertain the extent to which youth with differing backgrounds are able to translate their preparation into jobs which require varying degrees of skill.

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[4]See Garbin et al. (1970) for a descriptive, pilot study conducted on a nonrepresentative sample of young workers in three cities. While high school curriculum was not their primary variable of interest, they do report no difference in the degree to which graduates of the several programs reported being hired at anticipated levels, achieving expected income, or "coping" with jobs (pp. 118, 142).

[5]Kaufman and Lewis (1968) compared jobs held by youth using major occupational categories, selectively defining some blue-collar occupations as "skilled" (pp. 88-90, 159-169).

Earning Capacity

Previous studies of the relative effectiveness of the several high school curricula have most frequently compared the relative earnings of graduates. Not only in general follow-up studies but certainly in cost-benefit analyses, investigators have searched for differences in starting pay, in rates of pay at specified follow-up points, and in the progression of pay over time and with increased experience. However, the numerous studies of this kind have been characterized by considerable variation in conceptual framework and methods of analysis. Moreover, in many cases the data have been inadequate for the purpose. As a result, it is hardly surprising that the findings of these studies are inconsistent.

Least rigorous among previous studies are those comparing the earnings of groups of graduates without controlling for other characteristics known to be related both to high school curriculum and to measures of labor market success. While this shortcoming mainly typifies studies using sketchy data, it also characterizes Eninger's extensive national study of graduating classes of 1953, 1958, and 1962 which were surveyed in 1964. Although his data base included over 4,700 variables for more than 5,000 graduates, the analysis of earnings differentials did not employ the required controls in a multivariate framework. Moreover, the study's published findings, which appear in two massive volumes, appear to contain contradictions. For example, in relating the increase of wage rates over time to whether or not vocational graduates had or had not been employed in jobs related to their training, the 1965 volume states that:

> Earnings progression was found to be unrelated to . . . job relatedness. The lack of relation with job relatedness is particularly noteworthy. The earnings progression of those who go into the trades studied or highly related trades is no different from those who enter only slightly related trades or even completely unrelated trades (Eninger, 1965, p. 9-55).[6]

On the other hand, the 1968 report states:

> Table 43 provides the comparative data for those who started and were still in their field of study after two, six and eleven

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[6] Somers reports similar findings (1971, p. ii).

> years and those who started and were still out of their field of study. The former did substantially better in: . . . percentage hourly rate increase . . .
>
> The conclusion seems clear: whichever way the data is analyzed, those who have followed their line of study do better as a group in every important occupational outcome respect than those who left their field of study (Eninger, 1968, p. 2-55).

On the basis of a variety of assumptions and estimating techniques, many of which are at least questionable, Eninger derived a statistic that appears to have gained wide acceptance in the literature.[7] "Thus, over a period of about ten years, the academic graduates seem to overcome their earnings disadvantage of the early years" (1965, p. 9-61). However, Eninger's data on initial wage rates--from both the 1965 and 1968 volumes--do not support the existence of an earnings disadvantage for academic graduates in the early years out of school,[8] and his findings on the increase of wage rates over time are inconclusive (1965, p. 9-60) and are associated with the inconsistency on job relatedness referred to above. The questionable basis of both the initial disadvantage and the behavior of the differential over the ten-year period makes it unfortunate that Eninger's generalization is so frequently cited.

Among the studies of earnings differentials that have employed multivariate techniques only two have used national data. The first of these (Somers et al., 1971) was devoted to a comparison of graduates of vocational programs in secondary schools, technical schools and junior colleges and did not include comparisons with academic or general curriculum graduates.[9] The

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[7] See Davie (1967), Reubens (1974, p. 25), and Stromsdorfer (1972, pp. 51-52).

[8] See 1965, Table 148, p. 9-44; 1968, Table 45, p. 2-60.

[9] While such a comparison was intended, a variety of factors made it impossible to conduct comparative analysis satisfactorily (p. 11). However, in advance of the final publication of the study, preliminary reports which included such comparisons were distributed; these have been cited in various contexts (National Planning Association, 1972, pp. 141-147; Stromsdorfer, 1972, pp. 51-52).

other was an analysis by Stromsdorfer of National Longitudinal Surveys data, about which more will be said below in view of its obvious relevance to the present research.

The remaining multivariate studies have been confined largely to samples from selected areas in the northeast and contain findings which disagree about the effect of curriculum on initial wages and on the rate of change of wages with time and experience.[10] Moreover, in some of these studies, control variables have been used unwisely. One study, for example, controls for occupational assignment (Kaufman & Lewis, 1968, p. 138) which may be a direct result of the high school program. In another (Kaufman et al., 1969), which used a predominantly female sample, blacks and whites, males and females, and those in as well as out of the labor force were included in a single earnings model--inserting zero earnings for those out of the labor force. The coefficients thus obtained are, at best, difficult to interpret, and inconsistencies arise when comparing the regression coefficients which were produced using the total sample and those which arose from separate analysis of race and sex subgroups (pp. 137, 152-153).

Aside from the problems mentioned thus far, there has been no uniformity within previous studies with respect to the criterion measures. Some investigators have used hourly rates of pay (Corazzini, 1968; Schaefer & Kaufman, 1971a; and Taussig, 1968) while others have used total or average earnings over a selected period of time (Kaufman et al., 1969). In discussing this issue, the latter study pointed out that the use of an hourly rate "precludes a consideration of the employment factor" (p. 28) and consequently used two measures, average monthly earnings and percent of time employed. However, it is obvious that these two are potentially overlapping; also, each of these reflects--in addition to earnings potential--periods spent voluntarily out of the labor force.[11]

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[10] For example, see Kaufman and Lewis (1968, pp. 157-158), which discusses differences between the findings of that report (which has used a subset of the data also reported in Kaufman et al., 1967) and the preliminary findings of another (Kaufman et al., 1969). The 1968 report also notes that vocational schools had been selectively chosen for inclusion in the study (pp. 2-3).

[11] See pp. 101, 104, 109, 137, and 144. Individuals are classified "out of the labor force" at points when they have no jobs, nor are they actively seeking work. The same study (pp.

The Stromsdorfer Study[12]

The Stromsdorfer analysis of the NLS data (National Planning Association, 1972, Appendix B), because it is so closely related to this research and because it is illustrative of conceptual and methodological difficulties appearing in other works, will be reviewed in depth.

Stromsdorfer's work largely revolved around two multiple regression analyses. In both cases he regressed "weekly earnings" against a set of independent variables which includes high school curriculum in order to estimate the "effect" of the various programs on weekly earnings, controlling for the "effects" of other variables. The first regression is based on data collected in the 1966 (initial) survey and the second on the 1968 (the second follow up) survey of male youth.[13] In principle this approach is largely consistent with earlier work and with the theoretical literature on the subject, although the two cross-sectional analyses failed to take advantage of the longitudinal nature of the data. However, in execution the analysis contains several flaws.

Both regressions were based on all out-of-school males, presumably excluding only those for whom information on one or more critical variables was not ascertained or otherwise not available. Thus the sample included, at one extreme, respondents with post-graduate university education and, at the other, those who had dropped out of high school prior to graduation (or, indeed, those who never completed elementary school). Such a choice of universe makes great demands on the set of independent variables whose function it is to control for the effects of other influences.

An alternative approach, which would have been conceptually much cleaner, would have been to run several regressions on

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145-146) shows significant differences in the amount of time elapsed between graduation and the beginning of first job; thus, this difference may also "account for" the earnings and employment differences reported therein.

[12]The author is indebted to Professor Stromsdorfer for his comments and suggestions on an earlier draft of this section. Of course, any remaining errors or omissions are solely the responsibility of the author.

[13]See Appendix B, Tables B-2 and B-3, pp. 132 and 135-137.

subsamples stratified by level of educational attainment. Such a strategy would have permitted more confident statements on differences by curriculum, independent of the quantity of education obtained. For example, the academic curriculum is associated both with a low incidence of dropping out of high school and with a high rate of college entrance. In the model in question, the academic program was represented by a dummy variable, but in addition the model contained both linear and nonlinear terms for the number of years of school completed. Such an approach produces multicollinearity and places heavy and unwarranted reliance on the assumptions of independence and additivity which underlie the process of attributing explanatory power to individual variables. In addition, this strategy may have erroneously ascribed to "general curriculum" those who dropped out at such an early point that ascription to any curriculum is questionable; the treatment of such cases is unexplained in the text.

As stated above, Stromsdorfer used weekly earnings as the criterion variable. He then estimated "annuallized" differences in earnings among different groups by multiplying by 52.0 the empirically-derived difference in weekly earnings. This is a curious procedure in view of the fact that the data base includes such variables as (1) hourly earnings, (2) earnings on survey week job, (3) average weekly earnings for past year, and (4) total annual earnings during past year. These variables differentially reflect such influences as (1) overtime, (2) job changing, (3) holding multiple jobs, and (4) time not working. If Stromsdorfer had originally been interested in annual differences across all jobs and including differences in weeks worked, unemployed, and out of the labor force, his choice of weekly earnings was inappropriate. In the absence of discussion in the text of the rationale for this procedure, "weekly earnings" seems to represent a middle ground which is most difficult to justify.

In order to ascribe earnings differences to high school curriculum, Stromsdorfer appropriately utilizes regression analysis to control statistically for other variables. Elsewhere, he has stated that the set of "other variables" which are appropriate to analysis of cross-sectional samples would include: age, race, education, marital status, socioeconomic status, IQ, occupation, industry, labor market structure, and geographic region.[14] His own work on the NLS data excluded most of the variables in his recommended list, and the set of variables reportedly used in the

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[14]Stromsdorfer, 1972, p. 101. As indicated earlier, the use of occupation (or industry) is open to question.

1966 regression was not the same as that used in the 1968 regression.[15] Specifically, in neither case did he control for differences in socioeconomic background or scholastic ability,[16] nor did he introduce such variables as urban/rural or region of residence as price or demand variables.[17] Because of all these problems, it is exceedingly doubtful that one can rely on the results of the model for information about the effects of high school curriculum on earnings.

Stromsdorfer found no significant differences across curricula in his 1966 cross-section, but found a difference between former academic and former vocational students in the 1968 cross-section, in favor of the latter. Because of his failure to utilize appropriate control variables, it is not worthwhile to note the size of such differences.[18] However, his explanation of the inconsistency between the 1966 and 1968 findings is perplexing. He attributed the apparent inconsistency to changing economic conditions, stating that the earlier period--the

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[15] Pp. 132, 137. Current age of respondent and the square of the age when respondent left school do not appear in the 1966 list; however, the author has stated in correspondence that the former was used in both runs.

[16] Scholastic aptitude test scores were not included in the earliest versions of the NLS public use data tapes.

[17] In the case of the NLS data, rules of confidentiality preclude identification of residence of respondents. This in turn precludes the use of local area price indexes, but does not remove the necessity of controlling for area characteristics which are related to differences in both the high school programs and wages.

[18] An additional curiosity arises from the separately-reported results of running the 1968 data both unweighted and weighted (Appendix Table B-6, pp. 138-139). The coefficients thus obtained are not substantially different from one another; however, a comparison of the two sets of standard errors of the coefficients shows them to differ by factors larger than 50:1, leading the reader to suspect that a methodological error was made in performing a regression weighted for differences in probabilities of selection to the sample.

last quarter of 1966--was "a period marked by cyclical downturn and growth in unemployment" (p. 25), while the 1968 survey took place in "a period of rising economic activity and declining unemployment rates" (p. 25). In fact, the overall unemployment rate fell almost continuously between 1965 and 1969. He also stated:

> In periods when rising levels of economic activity reduce the pool of unemployed persons, employers are more likely to seek out the vocational graduates . . . At times when economic activity is slackening and unemployment is rising, the economic permium attached to vocational training diminishes (p. 26).

His reasoning was that vocationally-trained persons would be overlooked in a loose labor market because "other persons with work experience [would] compete for the same job with recent graduates with little or no experience" (p. 26). But this ignores the fact that he controlled for "age of respondent" in the 1968 cross-section. With age controlled, one would expect the effect of a loose labor market to be precisely the opposite of what he describes.

Another questionable aspect of the work involves the comparisons he chose to make. In all such evaluation studies one would prefer to have a "control" group which is identical to the "treatment" group except for participation in the program in question. However, in studies which purport to examine the impact of vocational education, the comparison has invariably been between alternative "treatments." In any event, one can argue that the most relevant comparison would involve the vocational versus the general program, since in both purpose and student body characteristics the academic program is quite distinct from both of these. It may be reasonable to assume that in the absence of a vocational alternative, the vocational students would more frequently enroll in the general program.

Nonetheless, Stromsdorfer's analysis of the NLS data as well as his reports of other findings are almost invariably comparisons of former vocational students and former academic students, ignoring the former "general" students (National Planning Association, 1972, Appendix Table B-6, pp. 141-147; Stromsdorfer, 1972, pp. 50-52). While it may be true that the only statistically significant differences that appear in the other studies cited by Stromsdorfer and in his own are those between vocational and academic programs, one suspects that the important question involves the general curriculum. Indeed the nonsignificance of

the latter may be a more important finding than that involving comparisons with academic students.[19]

The questions that have been raised concerning Stromsdorfer's analysis cast serious doubt on his conclusions. Leonard Lecht, reporting on Stromsdorfer's study, has observed that:

> The data supplied by one of the most recent and statistically reliable studies, the National Longitudinal Surveys . . . confirms the findings that participation in vocational [secondary] programs increases earnings (1974, p. 22).

Lecht's evaluation is completely premature, and more carefully designed analysis of the NLS data is required.

The Present Study

The approach used here examines hourly rate of pay, not weekly (or monthly, or annual) earnings. Then, as described below, unemployment experience is accounted for separately. This is believed to be a superior approach because comparing wage differences and unemployment experience separately can lead to more confident interpretations of the possible effects of curriculum. Earnings comparisons may show no difference between groups while masking important differences on the separate dimensions which counterbalance each other.[20]

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[19]Moreover, great caution is required in interpreting the results of studies which purport to be cost-benefit evaluations of educational programs but which are based in fact on non-representative data. Academic graduates in any sample of non-college-attending high school graduates are likely to be highly nonrepresentative of academic graduates as a whole. In fact, one might question the inclusion of academic students altogether, especially in view of the usual failure of many of these studies to present the conceptual reasons for doing so.

[20]For example, one group may enjoy higher wages than a second group but, simultaneously, experience greater unemployment. Such a case occurs in a recent study of the effects of unionism on wages of youth (Andrisani & Kohen, 1975).

Second, unlike most previous studies, the present study investigates interactions between high school program and post-high-school training. Third, it addresses the question of wage differences not only in terms of starting wages, but also in terms of wage changes. Specifically, the study includes (1) a cross-sectional model for testing differences in starting wage, in wage growth over time and in response to additional training; (2) a separate analysis of wages for the first three years out of school to concentrate on early wage differences; (3) a longitudinal model of the change in wage between 1966 and 1969 to concentrate on wage progression. Fourth, two other measures are used to illuminate the long run potential inherent in the emerging career pattern. Fifth, reported satisfaction with current job is also used as a criterion variable.

Last, since the unemployment of youth has been a subject of intense interest throughout the past dozen years, we address the question whether graduates of the programs differ with respect to the incidence of chronic or repeated periods of unemployment.[21] To this end, three measures are used: (1) the number of weeks unemployed as a proportion of weeks in the labor force within the past year, (2) the number of spells of unemployment in the past year, and (3) the unemployment status at the time of the interview.

In short, this study proposed to compare high school graduates from different curricula to illuminate the role of education and training in preparing youth for work. Among the criteria are a number of measures not used previously or not used in the manner proposed here, such as extent of occupational information, skill demands of jobs obtained, and desire for and acquisition of post-secondary training. In addition, there are a number of measures which have appeared previously in other studies, including wages, occupational status, reported job satisfaction, and incidence of unemployment. The next chapter contains the details of the present research design.

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[21] One component of unemployment, the time spent in job search immediately following graduation, has been studied. It is found that vocational students obtain first jobs faster. Whether this derives from greater placement assistance, more efficient search techniques, better information, more sharply delimited venues, or superior training has not been established.

CHAPTER IV

THE DATA BASE, VARIABLES AND MODELS

As has been mentioned, the empirical analysis is based on data collected in the National Longitudinal Surveys of the labor market behavior of young men.[1] A national probability sample of over 5,000 males between the ages of 14 and 24 was interviewed in the last quarter of calendar year 1966 and annually thereafter through 1971; information collected through 1969 was available for this study.[2] In addition to the personal interviews, a special mailed survey was conducted in 1968 to gather information from the high schools last attended by the youth.

The multi-stage probability sample was designed to overrepresent black youth in order to permit statistically reliable intercolor comparisons. The inverse of the sampling ratio

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[1]The young men comprise only one of the four age-sex cohorts included in the National Longitudinal Surveys. The NLS is sponsored by the Manpower Administration, U.S. Department of Labor, under the authority of the Manpower Development and Training Act of 1962. Under separate contract, the U.S. Bureau of the Census has been responsible for sample selection, field work, and preliminary data processing. The Center for Human Resource Research, The Ohio State University, has been responsible for the design of survey instruments and analysis of the data.

For a general description of the NLS as well as a bibliography of completed research, see Center for Human Resource Research (1973). For an extensive description of the data collected on the cohort of male youth, including details on sample selection and attrition at follow up surveys, see Parnes et al. (1970), Zeller et al. (1971), Kohen and Parnes (1971), Kohen and Andrisani (1973), and Andrisani and Kohen (1975).

[2]Attrition from the sample has been remarkably low and due primarily to entry into the armed forces (Kohen & Andrisani, 1973). Even here, efforts are made to reestablish contact after separation from active duty (Andrisani & Kohen, 1975).

(i.e., the "weight") relating to each individual is available for computing population estimates.[3] All of the analysis in the present study is based on weighted data.

Actually, only a subset of the NLS young men's sample as described above is used in the current work. Except where otherwise noted, attention is limited to those not enrolled in school at the time in question, who had completed high school and who had completed no years of college.

High School Curriculum

In the initial NLS survey, respondents were asked to name their high school program of study. In subsequent interviews, information was gathered on whatever change in curriculum occured during the interim. In all cases, responses were coded into four major categories: college preparatory, general, vocational-commercial, and other vocational; for simplicity, the latter two are identified in the empirical section of this study as "commercial" and "vocational," respectively.[4]

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[3]Strictly speaking, since the weight was based on initial selection to the sample and has not been revised in light of attrition, the use of the weight for computing population estimates is appropriate only with the initial sample (i.e., data from the 1966 survey). The use of weighted data from subsequent surveys introduces a downward bias to population estimates (because of attrition) and may also introduce bias in the results of specific analyses (due to the absence of observations on youth with characteristics associated with the probability of attrition, such as the highly mobile). Even so, because the 1969 data contain a larger overall sample of employed high school graduates than the 1966 (due to additional intervening graduations), and in view of our desire to use data which more nearly reflect career establishment, we often prefer the later data (1969 survey) to the earlier (1966), applying the same weight values to each.

[4]The results of preliminary processing indicated that the four-part grouping should be retained, to entertain the possibility of differences between vocational-commercial and other vocational. However, very few black youth had reported the vocational-commercial program, too few to permit separate analysis. It would have been possible to combine the vocational-commercial and other vocational students in a single category among blacks while retaining distinct groups among whites. Ultimately, blacks from "commercial" programs were eliminated entirely from the analysis in the interests of maintaining consistent definitions of "vocational."

Because of its centrality in this study, several major limitations of the curriculum variable need to be acknowledged. First, the direct responses of the youth were not encoded into a standard scheme, and analysis at any level more detailed than the four-part grouping described above is precluded. For example, those who took programs in auto mechanics cannot be distinguished in the data file from those who took vocational agriculture.[5]

Second, no information on curriculum was gathered in the 1968 high school survey. Consequently, it is not possible either to corroborate the self-reported curriculum or to identify respondents whose vocational program was a federally-reimbursable one.

Third, no information was collected from vocational graduates on the extent or intensity of their program of study, nor on their perception of the relevance of their studies to subsequent jobs. Thus we are forced to categorize identically those from four-year programs who had taken many vocational courses, as well as those who spent a year or less in such programs, taking few courses in the process. As a corollary, graduates of cooperative education programs are likewise not distinguished in the data file.

Lastly, we are unable to identify those who took programs in general business, general industrial arts, and other general curricula with a practical arts emphasis. Indeed, there may be cases where a "general" curriculum represents attendance at a single-track high school. Taken together, these limitations form a substantial constraint on the extent to which the findings can be generalized. While such factors give rise to concern, the substantial agreement between the NLS data and other sources cited in Chapter II on the overall distribution of graduates by curriculum is encouraging.

Previous chapters have indicated the necessity of controlling statistically for other attributes of the individuals which are known to be correlated with program of study and are hypothesized to influence the selected criterion measures. After describing such control variables, the dependent variables are presented, along with the models and subsamples relevant to each.

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[5] While such information may be recorded on the survey instruments used in the interviews, it is not available in the computerized data files. Survey instruments are retained by the Census Bureau to protect the confidentiality of participants.

Control Variables

Socioeconomic Index

For each individual in the data base an index representing the socioeconomic level of family of origin has been constructed as the weighted average of at least three of five components, depending on their availability:

(1) father's level of education,
(2) mother's level of education,
(3) educational level of oldest older sibling,
(4) father's occupation when respondent was fourteen, and
(5) an index of the availability of reading materials in the home.

The precise rules involved in the construction of our measure are reported in Kohen (1973, Appendix B, pp. 177-183).[6]

Scholastic Aptitude

A measure of scholastic aptitude has been constructed from scores on standardized tests which were collected in the high school survey.[7] This index is not represented to be, nor should it be construed to be, a measure of innate ability. Rather, it is presumed to be a result of a complex configuration of influences[8], including prior experiences in the school and in the home.

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[6]Similar constructs appear in Bachman (1967, 1970) and Flanagan et al. (1964).

[7]See Kohen (1973, Appendix A, pp. 155-174) for a detailed discussion of the procedures used to calculate this measure by pooling scores from the various tests reported by the schools.

[8]It may be noteworthy that the impact of such influences may be somewhat attenuated in this study. Because we focus on those with exactly twelve years of education, the variation in both the socioeconomic index and the measure of scholastic aptitude is smaller than in the total population.

Race

Each analysis is performed separately for whites and for blacks, except in a few instances where sample size precludes separate analysis of the black youth. Young men of other races are excluded entirely.

Price Level and Demand

In addition to the personal characteristics of respondents, two variables are frequently used in analyses of earnings to control for variations in price level and for differences in supply and demand conditions in the locality of residence.[9] The first, Residence in South, has been demonstrated to be related to price level. More refined measures of price level variation are, unfortunately, not available; confidentiality rules preclude revealing residence except by gross geographic areas.

The second, Residence in SMSA (Standard Metropolitan Statistical Area), serves as an additional proxy for price level as well as an index of area demand characteristics. Its use is similar to an urban-rural dichotomy.

Other Control Variables

Many of the remaining items used as independent variables in the regression analyses are virtually self-explanatory, such as Grade Attending,[10] which is a continuous measure, and Ever Worked and Military Service, which are dichotomies. In the models presented below, a year may be appended to the name of each variable to indicate the timing of the measure.[11]

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[9] See Somers et al. (1971) for similar procedures with national data. Kaufman et al. (1969) also employed such controls (i.e., for city of residence, on a sample of only three cities). See Fuchs (1967) for the necessity of such variables.

[10] Grade Attending and Ever Worked are used only when examining the occupational information test scores among in-school youth.

[11] For example, "Military Service, 1969" denotes whether or not (one or zero, respectively) the respondent had served in the armed forces as of the 1969 interview.

Dependent Variables and Models

Occupational Information

The extent of a youth's general occupational information is measured by the scoring of two series of questions asked in the 1966 interview.[12] In the first set, respondents were asked to identify in multiple-choice format the duties of ten selected occupations and to indicate the typical educational attainment of workers in each. In the second, respondents were asked to identify which occupation of a given pair normally yields higher earnings. While relatively unsophisticated, this measure nonetheless has been shown to be strongly related to other attributes of the youth on one hand, and to measures of subsequent labor market success on the other.

With the occupational information score as the dependent variable, multiple linear regressions will be run on two samples:

(1) Males enrolled in grades ten, eleven, or twelve at the 1966 interview date, with the following as explanatory variables:

Scholastic aptitude;
Socioeconomic index;
Grade attending (= 10, 11, or 12);
Ever worked (= 1 if has work experience);
Residence at age 14 (dummy variables):
- (a) rural farm (the reference group),
- (b) rural nonfarm,
- (c) small city,
- (d) medium-sized city, and
- (e) large city or suburb;

High school curriculum (dummy variables):
- (a) general (the reference group),
- (b) vocational
- (c) commercial, and
- (d) college preparatory.

(2) Males not enrolled in school in 1966, who had completed exactly twelve years of school, with these explanatory variables:

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[12] A description of the items, their scoring, the composite measure and its correlates is given in Parnes and Kohen (1975). For a technical analysis of the construct, see Kohen and Breinich (1975).

Scholastic aptitude,
Socioeconomic index,
Years of potential total work experience
(= age in 1966 minus 17),
Received training (= 1 if yes),
Military service (= 1 if served),
Residence at age 14,
High school curriculum.

The designation of the general curriculum as the reference group in each case above means that dummy variables will be introduced into the model only for the other three curricula.[13] As a consequence, the regression coefficients for these curricula are to be interpreted as deviations. That is, the regression coefficient of the dummy variable for the vocational program will represent the difference between the average vocational program graduate and the average general program graduate, other factors equal.

Adequacy of Preparation

In the 1966 interview, respondents who were not currently enrolled in school were asked the following three questions:

(1) Considering all the experience you have had in working or looking for jobs since leaving school, do you feel that not having had more education has hurt you in any way?
(2) If you could, would you like to get more education or training?
(3) (If "Yes" to the second) what kind of courses or training would you like to take?

Tabular analysis is used to ascertain whether graduates of the various programs differ in their perceptions of the adequacy of their preparation for the world of work.

Post-School Training

Supplementing the previous section, the high school graduates' actual participation in post-secondary training will be reviewed. In 1966, out-of-school respondents were asked a

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[13] Each of the three dummy variables will have the value one for graduates of the given program and will have the value zero for graduates of any other program.

series of questions on the training they may have received since leaving school in each of the following categories:

(a) business college or technical institute, such as drafting, electronics training, etc.;
(b) full-time programs lasting six weeks or more at a company training school;
(c) apprenticeship training or any other vocational or technical training (aside from regular school and on-the-job training given informally);
(d) additional general courses in a regular school such as English, math, or science; and
(e) training received in the Armed Forces (except for basic training).

In the 1967, 1968 and 1969 surveys, respondents were asked about training courses or educational programs taken since the preceding interview date. In all of these instances, training reported by the respondents under the categories: (a) professional or technical, (b) managerial, (c) clerical or sales, or (d) skilled manual are analyzed to ascertain whether the probability of obtaining such training is related to the high school program of study.

Skill Level

Information collected on the occupations respondents have held has been uniformly coded according to the three-digit categories used in the 1960 Census of Population. James Scoville (1969), in analyzing the changing job content of the U.S. economy, has presented for each 3-digit Census occupation category two ratings of the skill demands of jobs (pp. 80-90), which he had obtained originally from material on workers' traits from the Dictionary of Occupational Titles (Manpower Administration, 1965, pp. 651-653). A straightforward association permits the inclusion of Scoville's skill ratings in the present study.

The first of the two ratings, called General Educational Development (GED), is designed to embrace "those aspects of education (formal and informal) which contribute to the worker's (a) reasoning development and ability to follow instructions, and (b) acquisition of 'tool' knowledge, such as language and mathematical skills. It is education of a general nature" (Manpower Administration, 1965, p. 651). The second, termed Specific Vocational Preparation (SVP), represents the time needed to facilitate "average performance in a specific job-worker situation" (p. 652) and encompasses training received in vocational education, apprenticeship programs, in-plant and on-the-job training, and experience in other jobs. Both of these

are designed to reflect occupational skill level by estimating the general (GED) and specific (SVP) preparation required for average performance in jobs in the given occupational category.[14]

The GED and SVP scores are analyzed to determine whether differences exist among graduates of the several programs with respect to their ability to obtain demanding jobs. Mean values are computed for each curriculum for (1) the first job held after leaving high school and (2) the job held at the time of the 1969 survey; in the latter case, results will also be presented separately for graduates who have or have not had post-school training. Finally, the GED and SVP scores are used as criterion measures in multiple regression analysis.

Earning Capacity

From several points of view, the analysis of earning capacity is methodologically the most complex undertaking of the study. The variables and models which constitute the design are introduced below, beginning with a description of the measure "hourly rate of pay." This is followed by the presentation of various cross-sectional and longitudinal models which employ hourly rate of pay as the criterion measure. Then, because we recognize that (1) the central issue in analyzing earnings is the extent and nature of differentials in lifetime earnings, and (2) the NLS sample is limited to observations of youth not more than ten years out of school, we present additional formulations. In the attempt to predict differentials among graduates in the long run, an occupational index and a measure of potential earnings are described, along with the models relevant to each.

Hourly rate of pay. The basis of the measure hourly rate of pay (also called wages or wage rate here) is the response to the question, "How much do you usually earn at this job before deductions?" This was asked in each NLS survey of those

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[14]The measures are not based on an analysis of the characteristics of workers; rather they are based on an analysis of the requirements of jobs. Eckaus (1964) and Scoville (1966) are apparently the first to make use of these measures in empirical application, and their work lends credence to the present application. Subsequent criticism has concentrated on the interpretation of GED scoring as "years of school required" (Fine, 1968); clearly this criticism would not apply to our use of the measure. For other applications, see Berg (1971) and Kalleberg and Sorensen (1973).

currently employed as wage or salary workers.[15] When anything other than an hourly rate was provided, the reported value has been converted to an hourly basis by dividing by the number of hours usually worked in the appropriate time period.[16] As compared to measures of earnings over a longer period of time, (e.g., per week or per month) and to measures which are computed averages (e.g., average monthly earnings computed from data covering six years), this hourly figure has the advantage of being uncontaminated by variation in the extent of hours of work, dual job holding, incidence of unemployment and time out of the labor force.

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[15]The self-employed and those working without pay in a family enterprise are therefore excluded.

[16]The actual responses to the question were recorded as both an amount and a unit of time measurement (for example, $5,600 per year). Separately, we obtain the number of hours usually worked per week at the job in question. The rules for constructing an hourly rate for responses other than hourly are based on the unit:

$$\text{RATE} = \begin{cases} \text{AMOUNT} \div \text{HOURS} & \text{if per week} \\ \text{AMOUNT} \div (2 \times \text{HOURS}) & \text{if biweekly or semimonthly} \\ \text{AMOUNT} \div (4.33 \times \text{HOURS}) & \text{if per month} \\ \text{AMOUNT} \div (52.0 \times \text{HOURS}) & \text{if per year} \end{cases}$$

Hourly figures are considered "not ascertained" either when any required item is "not ascertained" or when the unit is a day rate or piece rate.

As a result of this procedure, our computed figure is biased upwards for respondents who usually earn an overtime premium and who report their usual earnings on a basis other than "hourly." (For example, a given individual may report usual earnings of $165 per week, which may derive from forty hours per week at a base rate of $3.00 per hour and ten hours of overtime at time-and-one-half. In such a case we would compute an hourly rate of pay of $3.30 per hour, by dividing $165 by fifty hours.) In preliminary analysis a variable which represented "potential overtime bias" was introduced into wage equations and found non-significant; even so, the potential overtime-induced bias within specific substrata of the sample represents an additional factor temporizing our interpretations of wage differentials. Other factors, well-known among economists, are discussed by Thurow (1970, especially pp. 17-22).

Wage models. First, a comprehensive cross-sectional regression model is used to analyze hourly rates of pay earned by the youth at the time of the 1969 NLS interview. Among the explanatory variables are several specially-constructed terms to permit testing in a single equation for curricular differences in (1) starting hourly rates of pay, (2) the slope of the wage-experience gradient, and (3) the impact of post-school training on wage rates. The complete list of explanatory variables appears below, followed by a brief discussion of the statistical methodology underlying the construction of this model; a more detailed discussion, including an analysis of the weaknesses of the statistical methodology, is provided in Appendix A.

Residence in South, 1969
Residence in SMSA, 1969
Scholastic aptitude
Socioeconomic index
Occupational information
Military Service, 1969
Years of experience, 1969
    Vocational differential
    Commercial differential
    College preparatory differential
Received training, 1969
    Vocational differential
    Commercial differential
    College preparatory differential
Intercept term
    Vocational differential
    Commercial differential
    College preparatory differential

There are three sets of "differential" terms in the model. The first set, appearing with the variable Years of Experience, consists of three curricular-experience interaction terms;[17] similarly, the second set consists of curricular-training interactions. The last set, appearing with the Intercept Term, are curricular dummy variables.[18]

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[17]These are constructed to be the products of the Years of Experience variable and each of the three curricular dummy variables; a differential term for the general track is omitted, since general graduates serve as the reference group.

[18]This set may be conceived to be the products of the Intercept Term (a vector of one's) and each of the three curricular dummy variables; general, which serves as the reference group, is omitted.

A brief illustration demonstrates the use of such a model. Without loss of generality, we focus on Years of Experience and its associated differential terms, identifying these with self-evident acronyms: YRS, VOC, COMML, COLL. Once the regression is performed, one can derive from the computed results a set of wage estimates, as follows:

$$(1)\quad \hat{WAGE} = \alpha\,(YRS) + \beta\,(YRS \times VOC) + \gamma\,(YRS \times COMML) + \delta\,(YRS \times COLL) + \tau, \text{ where}$$

$\alpha, \beta, \gamma, \delta$ = estimated regression coefficients.

τ = calculated contribution to $\hat{WAGE}$ of all other variables, estimated as the sum of the products of each other term in the model and its corresponding coefficient, where each other term is fixed at a common point (e.g., its mean) for the different curricula; thus, by assumption, τ does not vary by curriculum.

YRS = Years of Experience, a continuous measure.

(YRS x VOC), (YRS x COMML), (YRS x COLL) = the products of the Years measure and the dummy variable curricular identifiers.

Thereafter, wages can be estimated <u>separately</u> for each curriculum. For example, consider estimating the wages of general and vocational graduates:

$$(2)\quad \hat{WAGE}\,(general) = \tau + \alpha\,(YRS), \text{ where}$$

the other terms have disappeared because, for students in the general program, all the variables VOC, COMML, and COLL are zero.

$$(3)\quad \hat{WAGE}\,(vocational) = \tau + \alpha\,(YRS) + \beta\,(YRS \times VOC) = \tau + (\alpha + \beta)\,(YRS).$$

Comparing (2) with (3), we observe that the difference in the wage-experience gradient between the vocational graduates and the general graduates is represented by the estimated regression coefficient β. Moreover, a standard <u>t</u>-test can be used to ascertain whether this difference is statistically different from zero. Should it be, the calculated β is an estimate of both the

direction and magnitude of the net difference between the groups. On the other hand, nonsignificance implies that the groups do not differ with respect to the wage-experience gradient.

Similarly, the other two sets of differential terms provide the opportunity to test for differences by curriculum in the relationship between wages and post-school training (using the differentials for Received Training) and in starting wages (using the differential intercept terms: that is, when Years and Training are both zero).

While the results from the comprehensive cross-sectional model can illuminate the existing relationships, there is reason to be less than completely satisfied with this approach. First, the methodology has several weaknesses, which are elaborated in Appendix A. Secondly, this cross-sectional model is based in part on the assumption that data from younger and older youth can be used to estimate the relationship between wages and time (i.e., career experience). Lastly, the NLS data permit more ambitious designs.

A second cross-sectional model using 1969 wages is introduced to concentrate exclusively on starting rates of pay. Confined to youth who had no more than three years of work experience at the time of the 1969 survey, the second model includes the following explanatory variables:

Residence in South, 1969
Residence in SMSA, 1969
Scholastic aptitude
Socioeconomic index
Years of work experience, 1969
Received training, 1969
Military service, 1969 and
High school curriculum (dummy variables)
    General (the reference group)
    Vocational
    Commercial and
    College preparatory.[19]

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[19] In this model the set of differential terms relate exclusively to the intercept term. In effect, this is a test for a net difference by curriculum in wage level throughout the relevant range of early experience. Other differentiating terms are omitted because of the reduction in variation in experience and the considerably reduced overall sample sizes.

Third, to concentrate exclusively on the wage-experience gradient, a longitudinal model is used for those who were employed as wage or salary workers in both 1966 and 1969. Two variations are used: in the first, the criterion variable is the absolute increase in hourly rate of pay over the three-year period; and in the second it is the increase during the same time in terms of a percentage change. In each case the explanatory variables are:

Wage, 1966
Residence in SMSA, 1966
Scholastic aptitude
Socioeconomic index
Occupational information
Received training, 1966
Received additional training, 1966-1969
Military service, 1969 and
High school curriculum.[20]

Career potential. The models of earnings capacity presented thus far rely on estimates of differences in observed rates of pay. Such results adequately represent the first decade of work experience of the graduates, but none of the data involves youth over the age of 27 (i.e., in 1969). Thus, although recognizing the importance of the earliest years and using several techniques to estimate wage gradients, the data and methods produce results that are only suggestive of lifetime experience.[21] One way to explore the possible long run impact of the various kinds of career preparation is to compare the groups of graduates according to the socioeconomic status of the occupations they held in 1969.

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[20]The inclusion of differentials on the intercept term of this model is a test for differences in level of wage change, net of the factors for which we have controlled. The control variables include not only the wage level at the beginning of the period, but several other characteristics hypothesized earlier to predict wage, permitting a test of the effects of such factors in explaining subsequent wage change. For example, to the extent that scholastic aptitude has an effect which increases with time, its introduction as a variable will indicate this, and the curricular differentials will be net of it.

[21]Becker (1964) suggests that, for some youth, the correlation between current earnings and long-run earnings may be negative due to their taking early jobs at trainee's wages (p. 14).

The Duncan socioeconomic index of occupational status is one of the most widely-used occupational prestige indexes.[22] Because of its strong, virtually definitional association with average earnings and average educational attainment in an occupational category, it is used in the present study as a measure of the monetary and nonmonetary long run potential of the emerging career patterns of the young men.[23] The index is used as a dependent variable in the framework of the models used above; specifically the explanatory variables include:

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[22]See Duncan (1961) for a description of the basis of this measure. Duncan, Featherman, and Duncan (1968) and Featherman (1971) provide illustrations of its use.

[23]By definition, the value of the Duncan index assigned to any given occupational category is based on all workers in the category. In general, each category contains workers who vary considerably in such characteristics as experience, job responsibilities, and earnings. At the same time, young workers employed in the same category may be considered as ranking relatively low within the hierarchies existing in the category. As a result, for those having relatively little occupational tenure, lesser job responsibilities, and lower earnings than the average member of the occupational group, the Duncan score may be conceived to be a better measure of their long run potential than their wages in 1969. Finally, to the extent that young workers remain in the same category as they were in 1969, or move only to categories with similar Duncan scores, the value of the Duncan index for the 1969 job will reflect long-run potential.

The rationale presented above is not entirely realistic; in the first place, occupational mobility among workers is characterized by great diversity and unlikely to occur in accord with our mobility assumption. A more serious concern arises from the fact that occupational categories differ with respect to the diversity of their members; some categories are relatively homogeneous (e.g., apprentice or other occupations dominated by young workers), in which case the Duncan score in 1969 is not nearly as good a reflection of future experience. Unfortunately, neither the magnitude nor the direction of errors introduced by the violation of assumptions can be predicted with confidence. Of course, should the errors be distributed approximately randomly with respect to curriculum, the results will not be biased.

Residence in SMSA, 1969
Scholastic aptitude
Socioeconomic index
Occupational information
Years of work experience, 1969
Received training, 1969
Military service, 1969 and
High school curriculum.[24]

Supplementing the analysis of the Duncan index, the median earnings for each occupational group has been obtained from published sources[25] and is used as a criterion measure. Like the Duncan index, this measure is employed to describe the potentially-differing job horizons of the groups of youth.[26]

Indeed, it is altogether reasonable to expect highly similar results from the two measures. The advantage of the inclusion of both derives from the monetary and nonmonetary basis of the Duncan index as compared to the purely monetary basis of median earnings.

Job Satisfaction

Job satisfaction, at best an elusive criterion, is explored in dummy variable form; its mean is the proportion who report being highly satisfied with the job held in 1969. While this very limited measure may be an oversimplistic representation of satisfaction, prior experience has justified its continued use and generates confidence that it captures the quality intended surprisingly well.[27] Multiple regression analysis is used with

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[24]The variable Residence in South, which was used in models introduced above primarily as a price control, is not necessary here.

[25]Bureau of the Census, 1963, pp. 376-385. Another use of the same measure can be found in Andrisani (1973, especially pp. 97-104).

[26]The use of median occupational earnings is based on the same reasoning and assumptions as that associated with the Duncan index.

[27]See Nicholson and Roderick (1972), for the use of the same measure in a multivariate framework with the NLS data.

exactly the same independent variables as used in the Duncan index equation above, except for an additional control for current hourly rate of pay.

Unemployment Experience

Unemployment experience is measured in three ways. The first is the proportion:

$$\frac{a}{a + b}, \text{ where}$$

a = the number of weeks unemployed in past year (i.e., actively seeking employment or on layoff from a job),
b = the number of weeks worked in past year (i.e., working or on vacation, sick leave, etc.).[28]

Our second measure is the number of "spells" of unemployment which occurred within the past year; a "spell" is a continuous period of a week or more. Lastly, unemployment is measured by a dichotomous variable based on the employment status of the individual in the week preceding the 1969 interview.

In each case, multiple linear regression analysis will be used with the following explanatory variables:

Residence in SMSA, 1969
Scholastic aptitude
Socioeconomic index
Occupational information
Years of work experience, 1969
Received training, 1969
Military service, 1969 and
High school curriculum.

Taken together, this research design summarized in Table 4, constitutes a wide-ranging appeal to empirical evidence to ascertain the impact of educational policy in preparing youth for the world of work. The next chapter presents the findings.

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[28] Excluded from the denominator are weeks spent out of the labor force (for example, when the respondent is enrolled in school and is neither working nor looking for work).

Table 4

Review of the Research Design

Criteria	Samples
Occupational information.	Enrolled in grades 10-12, 1966.
Occupational information.	High school graduates, 1966.
Desire for additional training.	High school graduates, 1966.
Participation in additional training.	High school graduates in labor force, 1969.
Skill ratings on first job.	High school graduates, 1966.
Skill ratings on 1969 job.	High school graduates, employed, 1969.
Wages on 1969 job.	High school graduates, employed, 1969.
Wages on 1969 job (recent graduates only).	High school graduates, employed, 1969.
Wage changes 1966-1969.	High school graduates, employed, 1966 and 1969.
Status index on 1969 job.	High school graduates, employed, 1969.
Occupational earnings, 1969 job.	High school graduates, employed, 1969.
Job satisfaction, 1969.	High school graduates, employed, 1969.
Unemployment, 1969.	High school graduates in labor force, 1969.

CHAPTER V

EMPIRICAL RESULTS

This chapter contains the empirical findings on the relationships between differences in the preparation of youth for careers, on the one hand, and a wide variety of career-relevant criterion measures, on the other. After reviewing each separate analysis in detail, we close the chapter with a summary.

Occupational Information

The empirical analysis of the occupational information test consisted of estimating four multiple regression equations: for youth who were in or out of school in 1966 and, in each case, separately for whites and blacks. The findings provide no support for the hypothesis that vocational or commercial students possess greater general occupational information than do those from the general track.

As expected, the regression results[1] demonstrate strong associations between the knowledge score and personal characteristics of the youth. Aptitude and the index of family background were significant predictors in all four models. For those in school, youth in higher grades scored higher;[2] for those out of school, greater work experience led to higher scores.

Among whites who were in school in 1966, vocational students scored significantly lower than did the general students. In all

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[1]The detailed regression statistics appear in Appendix B, Tables B-1 and B-2.

[2]The results on Grade Attending are not necessarily suggestive of an effect of education; in the absence of a control for "age of respondent" and in view of the high correlation between age and Grade, the significance of Grade is somewhat ambiguous.

other comparisons between vocational or commercial students and those in the general track, differences were nonsignificant.

Comparisons between the college preparatory students and those in general programs yield only one statistically significant finding: white, out-of-school college preparatory graduates scored higher than their counterparts from the general track. This was not the case among blacks, nor was it true for either race among those who were still enrolled.

In the absence of significant differences among black youth, and in view of our mixed findings among whites, it appears that no program of study was superior in providing general information about occupations. It is certainly safe to conclude that vocational students did not enjoy an advantage.

Adequacy of Preparation

Table 5 presents the responses of graduates of each program to a trio of questions concerning their perceptions of the adequacy of their preparation for work. While among whites the nonvocational students were more likely to report that they felt hurt by a lack of education or training, this was not true among blacks. Moreover, all groups report desiring additional preparation in approximately the same proportions.

With regard to the kind of additional preparation desired, it is perhaps not surprising within this group of non-college high school graduates, to find that academic students report desiring to go to college at the greatest rate. However, it is unexpected to find among both whites and blacks almost no difference between general and vocational graduates. Such a finding provides no support for the view that graduates of the vocational track regard themselves to be better-prepared for the world of work than graduates of the general track.

Post-School Training

Table 6 presents the proportions of graduates who report having received training from various sources and of various kinds. While overall rates of participation vary only slightly, blacks appear to receive such training in lower proportions than white youth.

Among whites there is relatively little variation between the groups by source of training, except that occurring in the

Table 5

Attitudes towards Adequacy of Preparation by Curriculum and Race (Respondents with Twelve Years of School; Not Enrolled in 1966)

Item from 1966 survey	General	Vocational	Commercial	College preparatory
Whites				
A. Considering all the experience you have had in working or looking for jobs since leaving school, do you feel that not having more education has hurt you in any way?				
Percent responding "yes"	42%	29**	25*	50
B. If you could, would you like to get more education or training?				
Percent responding "yes"	83	83	87	88
C. (If "yes") what kind of courses or training would you like to take? Percentage distribution by type:				
White collar	27	28	26	25
Blue collar	35	39	17*	26*
"Go to college"	26	16*	30	37**
Other	12	16	28	12
Weighted n (in thousands)[a]	1,492	401	136	489
Blacks				
A. Considering all the experience you have had in working or looking for jobs since leaving school, do you feel that not having more education has hurt you in any way?				
Percent responding "yes"	57%	70	b	68
B. If you could, would you like to get more education or training?				
Percent responding "yes"	91	96	b	100
C. (If "yes") what kind of courses or training would you like to take? Percentage distribution by type:				
White collar	27	18	b	16
Blue collar	53	66	b	21**
"Go to college"	14	16	b	60**
Other	6	0	b	3
Weighted n (in thousands)[a]	227	54	b	35

[a]Here and elsewhere in the chapter, absolute numbers represent population estimates (i.e., weighted data). To obtain the approximate number of actual sample cases, it is necessary to know that each young white represents on average 4,000 youth and each young black about 1,000. Moreover, it should be noted that comparative analyses are generally omitted in instances involving less than 25 sample cases in either group. For further discussion of the weighting procedure and potential problems with it, see Chapter IV.

(Table continued on next page.)

Table 5

Continued

[b]Sample size does not permit separate analysis of blacks taking the commercial program.

* Statistically significantly different from the proportion of general graduates by t-test at .10 level.

** Statistically significantly different from the proportion of general graduates by t-test at .05 level.

Table 6

Participation in Post-Secondary Training, 1969, by Curriculum and Race
(Respondents with Twelve Years of School; Not Enrolled and in the Labor Force in 1969)

	Whites				Blacks[a]
	General	Vocational	Commercial	College preparatory	Total
Source					
All sources[b]	52%	54	63	67**	43
Business college or technical institute	20	15	13	24	16
Company school	15	22**	14	19	16
Apprenticeship or other vocational	9	10	0*	8	3
Military	15	11	12	11	12
Other sources (correspondence, night school, etc.)	18	19	36**	34**	11
Type					
Professional, technical	19	14	20	38**	23
Managerial	6	4	15**	9	1
Clerical, sales	8	9	11	11	5
Skilled manual	33	40	29	29	26
Weighted n (in thousands)[c]	1,386	460	137	467	223

Note: Appendix B, Table B-3 contains results of dummy dependent variable regressions. In the presence of controls, two more differences are statistically significant: the vocational-general comparison on receipt of skilled manual training and the college preparatory-general comparison on managerial training.

[a]Sample size does not permit cross-classification of blacks by both curriculum and detailed training categories.

[b]Unduplicated count; that is, youth reporting more than one training program are shown within the detail in every separate instance but are counted only once in "All sources."

[c]See footnote a, Table 5.

* Statistically significantly different from the proportion of comparable general graduates, by t-test at .10 level.

** Statistically significantly different from the proportion of comparable general graduates, by t-test at .05 level.

"other sources" category.[3] In contrast, the kind of training appears to vary substantially. College preparatory students report professional or technical training at nearly twice the rate of other students, while commercial students report much greater managerial training and vocational students report more skilled manual training. This latter finding, combined with the fact that over half of the vocational students reported additional training, underscores the importance of viewing the high school program within a broad context. While the school experience is no doubt important, both vocational graduates and the others sought and obtained additional training.

Skill Level

The GED and SVP ratings in Table 7 for the first jobs of the high school graduates present a somewhat mixed picture. While among whites the vocational graduates' first jobs were rated higher on the SVP, those of the commercial graduates were lower than the ratings of nonvocational graduates. Moreover, among blacks the vocational students' jobs had somewhat lower ratings. Thus, all things considered, the scores on the first jobs held after leaving high school do not indicate with any clarity that students from vocational programs can obtain jobs with higher skill requirements[4] than those obtained by graduates of other curricula.

A somewhat different pattern emerges from the comparisons of ratings on the jobs held at the time of the 1969 survey, shown in Table 8. Here, those who obtained additional training after leaving high school were found in jobs with higher ratings, and there are apparent curricular differences in favor of youth from the college preparatory program.[5] The vocational and, in

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[3]This is substantiated by dummy-dependent-variable regressions, shown in Appendix B, Table B-3. The results indicate that the strongest predictor of training is the elapsed time since graduation (years of work experience). This is likely a reflection of opportunity, but may also indicate that, as career plans stabilize with the benefit of experience, youth pursue formal training.

[4]Virtually identical results ensue when controlling for scholastic aptitude and family background; see Appendix B, Table B-4.

[5]See Appendix B, Tables B-5 and B-6, for regression results with the GED and SVP. In the presence of controls, the college preparatory advantage is diminished.

Table 7

Mean Values of Skill Level for First Jobs Held by Graduates, by Curriculum and Race (Respondents with Twelve Years of School; Not Enrolled in 1966)

Skill level variable	All graduates	General	Vocational	Commercial	College preparatory
			Whites		
SVP rating[a]	1.30	1.27	1.58*	.80*	1.29
GED rating[a]	9.15	9.04	9.43	8.77	9.33
Weighted n (in thousands)[b]	1,923	1,903	318	109	402
			Blacks		
SVP rating[a]	.95	.95	.56	c	1.32
GED rating[a]	8.30	8.16	7.41	c	9.76**
Weighted n (in thousands)[b]	168	118	23	c	26

Note: See Appendix B, Table B-4, for regression results which control for scholastic aptitude and socioeconomic level of family background. The regressions reveal the same three instances of significant differentials as the table above.

[a]The unit of measurement of both ratings was originally designated by Scoville (1966, 1969) in terms of "years." In the case of the GED rating, this was represented as "years of school," a designation which prompted serious objection by Fine (1968). We conceive these to be indexes independent of unit, even though we have not standardized to a common metric.

[b]See footnote a, Table 5.

[c]Sample size does not permit separate analysis of blacks taking the commercial program.

* Statistically significantly different from the mean value for general graduates, by t-test at .10 level.

** Statistically significantly different from the mean value for general graduates, by t-test at .05 level.

Table 8

Mean Values of Skill Level for Jobs Held in 1969, by Curriculum, Training and Race (Employed Wage or Salary Workers with Twelve Years of School and Not Enrolled in 1969)

Skill level variable	General	Vocational	Commercial	College preparatory
Whites				
SVP rating:[a]				
All graduates	1.54	1.69	1.70	1.79*
Those with post-secondary training	1.61	1.86	b	1.92*
Those without	1.46	1.47	b	1.48
GED rating:[a]				
All graduates	9.87	9.98	10.22	10.54**
Those with post-secondary training	10.28	10.39	b	11.07**
Those without	9.41	9.48	b	9.19
Weighted n (in thousands)				
All graduates	1,230	410	114	420
Those with post-secondary training	650	231	b	295
Those without	580	179	b	125
Blacks				
SVP rating:[a]				
All graduates[c]	1.19	1.41	d	1.59
GED rating:[a]				
All graduates[c]	8.92	8.99	d	9.89*
Weighted n (in thousands)	144	45	d	25

Note: For regression results with these data, see Appendix B, Tables B-5 and B-6.

[a] See Table 7, footnote a.

[b] Sample size does not permit comparison of white commercial graduates within categories of training.

[c] Sample size does not permit cross-classification of blacks by both curriculum and receipt of training.

[d] Sample size does not permit separate analysis of blacks taking the commerical program.

* Statistically significantly different from mean value for comparable group of general graduates, by t-test at .10 level.

** Statistically significantly different from mean value for comparable group of general graduates, by t-test at .05 level.

the case of whites, the commercial groups both have higher scores than the general track, though in none of these cases is the difference statistically significant.[6]

Taken at face value, the findings with respect to the GED and SVP ratings are at odds with two beliefs: that vocational students have been provided skills which lead to "better" jobs--in the sense of these two measures--and, secondly, that general curriculum graduates are set adrift in the labor market without the skills and abilities which graduates of other programs possess.

Wages

The statistical analysis of differentials in hourly rate of pay produced a few unexpected results. The findings for black youth[7] contain no significant curricular differences whatever. Indeed, except for the strong negative effect of Residence in South, the regressions for black high school graduates contain few relationships of significance; even measures for the extent of work experience and for post-school training are nonsignificant or negative.

Such is not the case in the results for white youth.[8] First, no significant curricular differentials in starting rate of pay were found.[9] Second, the results of the comprehensive cross-sectional model[10] include only one curricular differential:

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[6]The same conclusion holds in the presence of controls. See previous footnote.

[7]See Appendix B, Table B-7, for the comprehensive 1969 cross-sectional model, and a replication on 1966 data in Table B-9.

[8]See Appendix B, Tables B-7 and B-8, for variants of the 1969 cross-sectional analysis and Table B-9 for replication on the 1966 cross-sectional data.

[9]Appendix B, Table B-10, contains results of the model applied to youth who had graduated within the previous three years. This attempt to concentrate on the earliest period of work produced no significant curricular differentials. In addition, no significant intercept differentials emerged from the several variants of the comprehensive cross-sectional models; see previous footnote.

[10]See Appendix B, Tables B-7 and B-8 for variants of the 1969 model and Table B-9 for a replication on 1966 wages.

namely, that vocational graduates benefit more from additional training than do other youth.[11] Moreover, in experimentation with variants of the model we were unable to explain the significance of this term either by high wage industries (i.e., construction) or by the effects of unionism.[12] Last, concerning the wage-experience gradient, no consistent differences between

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[11]This relationship emerges as Table B-8, which contains results with all differential terms in the model. Table B-7 shows results when forward stepwise entry was terminated before any nonsignificant differential entered. In the latter case, a negative association between Vocational and Years of Work Experience also emerged. On face value, the combination would be interpreted to mean that such students gain more from formal training, but less from overall experience. The replication on the 1966 cross-section, in Table B-9, only shows the Vocational-Training differential as significant; and the longitudinal model which concentrated on the change of wages with increased experience showed no significant curricular difference (Appendix B, Table B-11).

Since the coefficient of Received Training for the reference group is nonsignificant, it is possible to interpret the results in another way: namely, that vocational graduates are the only ones to benefit in wage terms from post-school training. However, this interpretation was not advanced for two reasons. First, Years of Experience and Received Training are highly correlated, a phenomenon which reduces confidence in the nonsignificance of training; refer to Appendix A for the underlying rationale. Second, the training variable is statistically significant in other variants as well as in the long-run experience models.

[12]Appendix B, Table B-8, contains a variant including controls for (1) employed in the construction industry and (2) wages set by collective bargaining; both of these are highly significant, but the Vocational-Training differential is unaffected. In a further exploration, we examined in detail the records of all young white high school graduates who earned over $4.35 per hour ($N$ = 76) and found vocational graduates over-represented in the subset (n = 18). In general, the subgroup was found in Construction (n = 32) and Manufacturing (n = 30), many of whom had had company-sponsored or apprentice-variety training (n = 30), whose wages were set in collective bargaining (n = 41), and most of whom were full-time, full-year workers.

graduates of the various programs emerge.[13] Throughout the analysis, the control variables--particularly the scholastic aptitude, occupational information, and socioeconomic index measures--were significant, but not consistently so.

Career Potential

The analyses of the Duncan index scores of the jobs held by the graduates of different curricula yield different results from the findings on rates of pay.[14] Among whites, both the commercial group and the college preparatory group have higher Duncan scores than the general group. Among blacks, the college preparatory group enjoys higher scores than the general graduates. However, comparisons between vocational graduates and general graduates yield nonsignificant differences. Thus, under the assumption that the Duncan scores reflect the long-run prospects of the graduates, it would appear that the college preparatory students and, in the case of whites, the commercial graduates have the most favorable career positions.

The analysis of median occupational earnings[15] yields similar conclusions for whites. However, among black youth, the positive differential for college preparatory students is nonsignificant.

Job Satisfaction

Among whites, the results of the analysis of job satisfaction[16] are parallel to the results of the Duncan and

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[13]See footnote 11 above for a finding in the 1969 cross-section of a negative differential for Vocational students, which did not recur in the longitudinal model. The most noteworthy finding in the wage change equations is that change is significantly related to the scholastic aptitude score, a finding which conflicts with earlier but non-multivariate analysis of these data (Kohen & Andrisani, 1973, pp. 92-94). In addition, variants of the model which do not include the aptitude variable or the occupational information variable do not alter the curricular findings (compare to Kohen & Parnes, 1971, pp. 74-77).

[14]See Appendix B, Table B-12.

[15]See Appendix B, Table B-13.

[16]See Appendix B, Table B-14.

occupational earnings analyses. Commercial and college preparatory graduates report higher levels of overall satisfaction from their jobs than do graduates of the general track, while the latter group is not significantly different from the vocational track. Among blacks, expressed job satisfaction is much lower than among whites, but no significant curricular differentials emerge.

Unemployment Experience

The models to analyze the incidence, frequency, and duration of unemployment among the high school graduates were inadequate for explaining variations in unemployment.[17] Thus, no conclusions with respect to curricular differences are possible, although it may be noted that none of the regressions yielded significant coefficients for the curriculum dummy variables.

Summary

Table 9 contains a detailed summary of the findings relating to curricular differences. The remainder of this chapter summarizes the major findings on the career preparation and early career achievements of young men. We reserve for the final chapter a discussion of the policy implications of the results.

Career Preparation

In our desire to study the ways in which youth establish foundations for careers, we have asked whether those in various high school programs differ with respect to a variety of criteria. These include: (1) general knowledge of the world of work; (2) felt needs for additional, post-school preparation; (3) actual subsequent participation in various kinds of post-graduation training and learning opportunities; and (4) skill level of the first jobs--and subsequent jobs--obtained by the youth.

First, in only one of four analyses of general occupational information did youth from the college preparatory program appear to possess an advantage (relative to those from the general track), while in another of the four, vocational youth appeared at a disadvantage. Thus we found no consistent evidence

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[17] See Appendix B, Tables B-15, B-16, and B-17.

Table 9

Summary of Curricular Differences [(+) and (-) Indicate Statistically Significant Differences between Graduates of the Designated Curriculum and Comparable Graduates of the General Curriculum]

Criterion (sample)	Results for white youth	Results for black youth
Occupational information (in-school, 1966)	(-) Vocational	None
Occupational information (graduates, 1966)	(+) College preparatory	None
Attitudes towards additional training (graduates, 1966)	Mixed[a]	Mixed[b]
Participation in additional training (graduates in the labor force, 1969)	None by rate; several by type[c]	d
Skill level of first job (graduates, 1966)	Mixed[e]	Mixed[f]
Skill level of 1969 job (graduates, employed in 1969)	Mixed[g]	Mixed[f]
Starting wages (graduates employed in 1969)	None	None
Wage-experience gradient (graduates employed in 1969)	None	None
Wage effects of post-school training (graduates employed in 1969)	(+) Vocational	None
Career potential, using Duncan index (graduates employed in 1969)	(+) Commercial and college preparatory	(+) College preparatory
Career potential, using occupational earnings (graduates employed in 1969)	(+) Commercial and college preparatory	None
Job satisfaction (graduates, employed in 1969)	(+) Commercial and college preparatory	None
Unemployment (graduates in the labor force, 1969)	h	h

(Table continued on next page.)

Table 9

Continued

[a]Commercial and vocational graduates were less likely to feel hurt by a lack of education or training, but as likely to desire additional education or training. Concerning the type desired, several differences emerged: vocational graduates were less likely to have going to college, while college preparatory graduates were more likely to do so; commercial and college preparatory graduates were less likely to desire blue collar training.

[b]College preparatory graduates were more likely to desire going to college and less likely to desire blue collar training.

[c]College preparatory reported more professional and technical training, while commercial reported more managerial, and vocational reported more skilled manual.

[d]Tests were not performed for blacks due to inadequate sample size.

[e]With SVP ratings, the commercial graduates were lower and the vocational graduates were higher; no differences emerged with GED ratings.

[f]College preparatory graduates held jobs with higher GED ratings but not higher SVP ratings.

[g]College preparatory graduates held jobs with higher ratings, an advantage which diminished in the presence of controls.

[h]Basic results indicated the model was inadequate for testing curricular differences.

that any high school program was superior or inferior in providing information about the world of work.

Second, irrespective of the high school program of study, over half of the white youth and over 40 percent of blacks reported participating in additional training and learning opportunities after high school graduation. In addition, over four-fifths of all young high school graduates reported a desire for additional preparation for work.

Interestingly, the desire for, and subsequent participation in, post-school training and learning opportunities was no lower among vocational graduates than among youth from other programs. In addition, the findings of the analyses of skill level also failed to favor vocational graduates.

Lastly, in only one instance did we identify what appeared to be substantial programmatic variation; this occurred among the kinds of post-school training received by the youth. Among whites,[18] young men from college preparatory programs who did not go to college report taking more professional or technical post-school training, while high school commercial graduates take more managerial training and vocational students take more skilled manual training.

Early Career Achievements

Examinations of the young men's hourly rates of pay revealed no curricular differences in starting rate of pay and no consistent differences in the wage-experience gradient. On the other hand we discovered that, among whites, youth from vocational curricula profit more than those from other programs from the post-school training they received. The models based upon the Duncan index and on occupational earnings led to somewhat different results: namely, that graduates of commercial and college preparatory programs appear to have more favorable long run prospects than those from vocational and general programs. Among blacks virtually no curricular difference appears for any criterion measure. Moreover, the wages of young blacks do not appear to grow with either post-school training or increased work experience.

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[18] Sample size did not permit the same analysis among blacks.

CHAPTER VI

CONCLUSIONS AND POLICY IMPLICATIONS

This study investigates the preparation of youth for careers. Using data on a national sample of young men, we focused on those who graduated from high school but did not attend college to explore the relationships between specific aspects of career preparation and a variety of actual performance criteria relating to success in the world of work. This chapter addresses the policy relevance of the most important findings of the study.

Occupational Information

The analysis of scores on a general occupational information test revealed several important points. As expected, performance by the young men on the test was directly related to socioeconomic level of the family and to scholastic aptitude scores of the youth. However, controlling for these and other factors, there was no consistent association between the amount of information possessed by youth and their high school curriculum.

For a number of reasons we had originally expected to find that commercial and other vocational students would outperform those in the general track on the test. For one, vocational curricula emphasize vocational matters, while the general curriculum may not. In addition, since vocational students have already made the choice of a specific vocational area, it is conceivable that they would have greater personal understanding of the world of work and also would have acquired superior information in the course of vocational counseling and assistance received in connection with that curricular choice. None of this, however, is supported by the data. Rather, the results indicate that those already tracked to specialty areas in high school possess no better general knowledge of the world of work than those deferring such a choice. In fact, the findings are consistent with the view that students may be tracked for external, often custodial reasons unrelated to career development.

Second, the strong relationship between family background and occupational information is itself a somewhat disturbing finding. It suggests that schools do not do much to compensate for differences in home influence on the breadth of career horizons. Since there is evidence that greater occupational information leads to better and higher-paying jobs, net of differences in background and other characteristics, it is clear that information is a very important factor in career preparation. Therefore, we strongly urge educational authorities to give priority to programs that will enhance the amount and kinds of such information among youth.

Vocational Training and Skills

Another important part of the process of preparing youth for careers is the provision of skills required for successful performance in the world of work. This study employed several measures to explore the adequacy of high school programs in relation to training and skills.

First, it is significant that over 80 percent of all high school graduates who did not go on to college expressed a desire for additional training or education and that over 50 percent reported actual participation in some kind of additional training within the first 5 years after leaving high school. On both measures, the responses of commercial and other vocational graduates were found to be very similar to the responses of youth from nonvocational curricula.

Second, analysis of the skill level of the jobs actually obtained by graduates failed to support the view that commercial and other vocational graduates are more able than youth from other curricula to obtain skilled jobs. Obversely, graduates of the general track did not appear disadvantaged in this respect. On none of the measures could we conclude that commercial or other vocational graduates were better prepared for jobs than youth from other tracks.

Overall, the results indicate an important role for post-school training and learning opportunities for all young men. The fact that education and training do not typically end at high school graduation--even for those whose formal schooling terminates at this point--suggests that it is unwise to promote vocational education at the secondary level as the last or only opportunity for career preparation. Rather, school personnel, including teachers, counselors and other support staff, should be directed to provide information on the nature and role of post-school training and learning and on the opportunities for such experiences.

Unfortunately, there is also evidence that these opportunities may not be equally available to all. While young blacks reported a somewhat greater desire for additional training than whites (90 vs. 80 percent), they received such training somewhat less frequently (40 vs. 50 percent). This may mean that access to training is limited for black youth by financial barriers or by discrimination. Labor market policies designed to assist the establishment of youth in careers should be directed against barriers of these kinds.

Lastly, the only significant relationship that has been found between high school curriculum and post-school training concerns the type of post-school training received by young whites. Among commercial graduates, such training was largely managerial in nature; for other vocational graduates it was predominantly skilled manual training. College preparatory graduates typically reported professional and technical training, but among those from the general track no type predominated. Thus, school training appears to be an extension and refinement of the career preparation process. Labor market policies which would expand opportunities for post-school training and learning would benefit both those whose career interests had coalesced during high school and those whose had not.

Wages

Analysis of the relationship between high school program and the other labor market performance criteria that have been examined points to no clear superiority of any curriculum for those who do not go on to college. Among young white graduates the relative effectiveness of the several programs varies with the choice of criteria; among young blacks, there are virtually no significant curricular differences by any criterion.[1]

In contrast to whites, by most measures young blacks fail to progress even with increased work experience and additional training. The regression coefficients for these factors were frequently nonsignificant and in many cases were negative. Thus while our conclusions in this regard must be tentative because of the limitations of small sample size, it appears that there are limits to the extent to which post-school training and

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[1]The sole instance of a curriculum difference among young blacks is that graduates of the college preparatory course held jobs with somewhat higher Duncan index scores than those from other programs.

experience are helpful in advancing blacks. Moreover, the absence of curricular differences in labor market performance should be cause for concern among those who view vocational education as being especially important for youth from minority and disadvantaged backgrounds.[2]

In the case of whites, curricular differences vary by criterion. Both cross-sectional and longitudinal analyses were used to ascertain whether there were differences among the graduates of the several programs either in beginning rates of pay or in the responsiveness of wage rates to training and work experience. The results indicate that graduates of vocational (but not commercial) programs who also receive additional post-school training enjoy significantly higher rates of pay than other graduates. However, the wages of commercial and other vocational graduates without additional training do not differ from the wages of graduates of the general track. Moreover, there are no significant differences for any group either in starting rates of pay or in the increase of rates of pay with additional experience.

Among vocational graduates who received additional training, the training was predominantly skilled manual training, and the jobs they held were typically blue-collar positions in manufacturing and construction. However we have ruled out the possibility that the wage advantage of this group is attributable either to the generally high wage levels which prevail in the construction industry or to the effects of unionism.[3] Thus, our finding may be interpreted as evidence of a possible complementarity between some secondary-level vocational programs and some forms of post-school training. Such would be the case if post-school programs extend and refine that which was learned in school. The finding may also mean

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[2]It might be well to reemphasize that we have not explored all the respects in which vocational programs might be advantageous over other curricula. For instance, we have produced no evidence on the relative "holding power" of the different curricula during the high school years. In addition, such roles as parenthood and citizenship may be better served by different curricula. Lastly, there may also be aspects of labor market success which our measures do not capture.

[3]See Chapter V, footnote 12 above.

that the vocational curriculum serves as an entry credential for certain skilled manual training programs to which access is limited.[4]

Career Potential

Analysis of the estimated career potential of the youth yields results which differ from the findings on wages. For this purpose we have used the Duncan socioeconomic index as well as the median earnings of the youth's most recent occupation to represent his probable position in the occupational and wage hierarchies in the future.[5] Comparisons of the graduates of the several programs according to these variables suggest that commercial and college preparatory graduates have the most favorable career prospects. Youth from these high school programs are apparently directed toward white-collar occupations that carry greater prestige (in the sense of the Duncan index) and may also present greater opportunity for advancement over the long run. It is interesting that these same two groups also registered significantly higher satisfaction with their jobs than did graduates of other programs.

Conclusions

Our analysis of the relationship between career preparation of youth and a wide variety of career-relevant performance criteria fails to support the case that vocational education is superior preparation for the world of work for male high school graduates who do not go on to college. The absence of a relationship between the vocational curriculum and criterion

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[4]Of course, the observed relationship may be entirely spurious. For example, a youth whose father is a union carpenter may choose the vocational track in school, may have completed a carpentry apprenticeship, and may also earn high wages. If so, it might appear that the combination of programs has been effective, but it is also possible that the father's influence was the most important factor in both job placement and acquisition of skills.

[5]We have drawn attention earlier to the incidence of cases known to violate our assumptions and have also noted that there is no evidence of a greater rate of increase in wages, during the early years out of school, among youth with higher values on these measures.

measures used in the study is especially significant in the light of historical debates concerning vocational education.

Proponents have argued in the past that, without vocational programs in the schools, youth are set adrift in the labor market with dismal prospects for success because of the lack of skills. On the other hand, when vocational programs are criticized for developing highly specialized skills which are subject to obsolescence, proponents have denied that such programs are highly specific and have represented them as being relevant to job clusters, providing for the student a broad orientation to large sectors of the world of work.

The results of this study suggest that vocational education at the secondary level does not provide an advantage over other curricula in either respect. They impart no better understanding of the world of work, nor do they appear to provide a skill advantage, for graduates desire and obtain post-secondary training at no lower rates than do nonvocational graduates and obtain jobs at virtually the same skill levels.

It must be emphasized that our results do not necessarily mean that vocational education served no useful purpose during the period covered by the study which would justify its generally higher cost. For example, its possible effect in reducing high school dropout rates is only one of many questions that the study has not addressed. For another, if young men select vocational programs for avocational reasons, analysis such as ours will fail to uncover a comparative market advantage even for high quality programs.

In addition to all the foregoing, it must be recognized that from a methodological point of view there may be imprecision in the reports of respondents of the curriculum they pursued. Moreover, aside from this, analysis of a national sample may fail to reveal the superior effectiveness of particular state or local programs.

Nonetheless, we believe the findings merit careful attention. Our failure to observe a market advantage among vocational graduates leads us to urge that each vocational program be examined for the presumed market relevance which is so often stated to be the basis for its support. In this connection it would be well, given the greater cost of vocational programs, to identify those types of careers for which the other curricula provide at least as good preparation.

Summary of Policy Implications

To summarize, the findings of this study have at least four major implications for secondary schools and those responsible for educational and training policy. In the first place, those involved in secondary education need to be cognizant of the fact that youth who select vocational specialty areas in their early high school years appear to do so on the basis of no better information than is possessed by those who defer such a choice. Society can ill afford to allow career foundations to be developed so haphazardly. Schools must make special efforts to impart to youth and their parents not only information about careers generally but also about the role and importance of post-school training and learning opportunities.

Secondly, the contributions to several facets of labor market success that is provided by post-secondary training, together with the finding that not all youth who desire such training are in fact receiving it, emphasize the desirability of increasing the accessibility of such programs to young men. Third, in the same context, the racial differences that have been documented point to the need for conscious efforts to promote additional training of young blacks. In this case, however, such efforts must be accompanied by labor market policies that will reduce discrimination and allow the same payoff to training and work experience for blacks as is enjoyed by young whites.

Fourth, although the present study has produced no direct evidence on this point, its findings are at least consistent with the hypothesis that while vocational education overall creates no labor market advantages for its graduates, there may be specific programs that do. It is incumbent on state and local education authorities responsible for the allocation of resources among programs to ascertain which specific types of careers are best served by each curriculum and to modify program offerings to better serve the needs of youth and society.

The suggestions summarized above are not novel, and several of our recommendations coincide with those being advanced by proponents of "Career Education." In turn, these are also found in earlier literature, including reports from the Educational Policies Commission prior to World War II and proposals of the "Life Adjustment" concept afterwards. Indeed much earlier antecedents can be found. These suggestions bear reiteration, however, because the findings of this study indicate that they continue to be relevant.

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APPENDIX A

STATISTICAL TESTS OF THE SIGNIFICANCE OF INTERGROUP DIFFERENCES IN REGRESSION

The following is a discursive essay on statistical tests of the significance of intergroup differences in regression. The discussion is intended to elucidate (in a non-rigorous way) various problems arising in the application of several recommended methods.

To begin, there are many possible kinds of differences to which the methodology under discussion is relevant. Figure A-1 contains four such possibilities in the case of two groups (i.e., the total sample is comprised of two distinct subsets of cases) and a model with only one independent variable. That is, the model shown in equation (A-1) below:

$$Y_j = \alpha_0 + \alpha_1 X_{1j} + \varepsilon_j, \qquad \varepsilon_j \text{ is the stochastic term} \qquad \text{(A-1)}$$

is performed twice: first for the cases $j = 1, \ldots, n_1$ which lie in Group 1 and again for the cases $j = n_1 + 1, \ldots, N$ for those in Group 2. The resulting estimated regression coefficients for each group are used to plot a separate regression line for each.

In case (a) of Figure A-1, there is no difference between the regressions of the two groups. In (b) the regressions differ with respect to intercept but not with respect to slope, for the lines are parallel. In (c) there is a common intercept point, but the slopes differ. Last, in (d) there are differences in both intercept and slope.

These hypothetical cases could conceivably represent, for example, possible relationships between wage rate and experience for graduates of two different high school programs. Case (d), for instance, would portray a situation where one group of graduates begins at a lower wage rate than the other, but eventually surpasses the latter due to a higher payoff rate to work experience.

These examples do not exhaust the possibilities. It is conceivable, for example, to encounter a situation where the domains or ranges are nonoverlapping. Figure A-2 shows such cases.

Various methods have been recommended for the study of such phenomena (Chow, 1960; Cramer, 1972; Fisher, 1970; Gujarati, 1970a and 1970b; Kullback & Rosenblatt, 1957). It will be shown, however, that the common basis of the recommended methods is flawed in important respects, reducing the confidence with which they can be applied. Essentially, each involves testing the statistical significance of the "contribution" of a

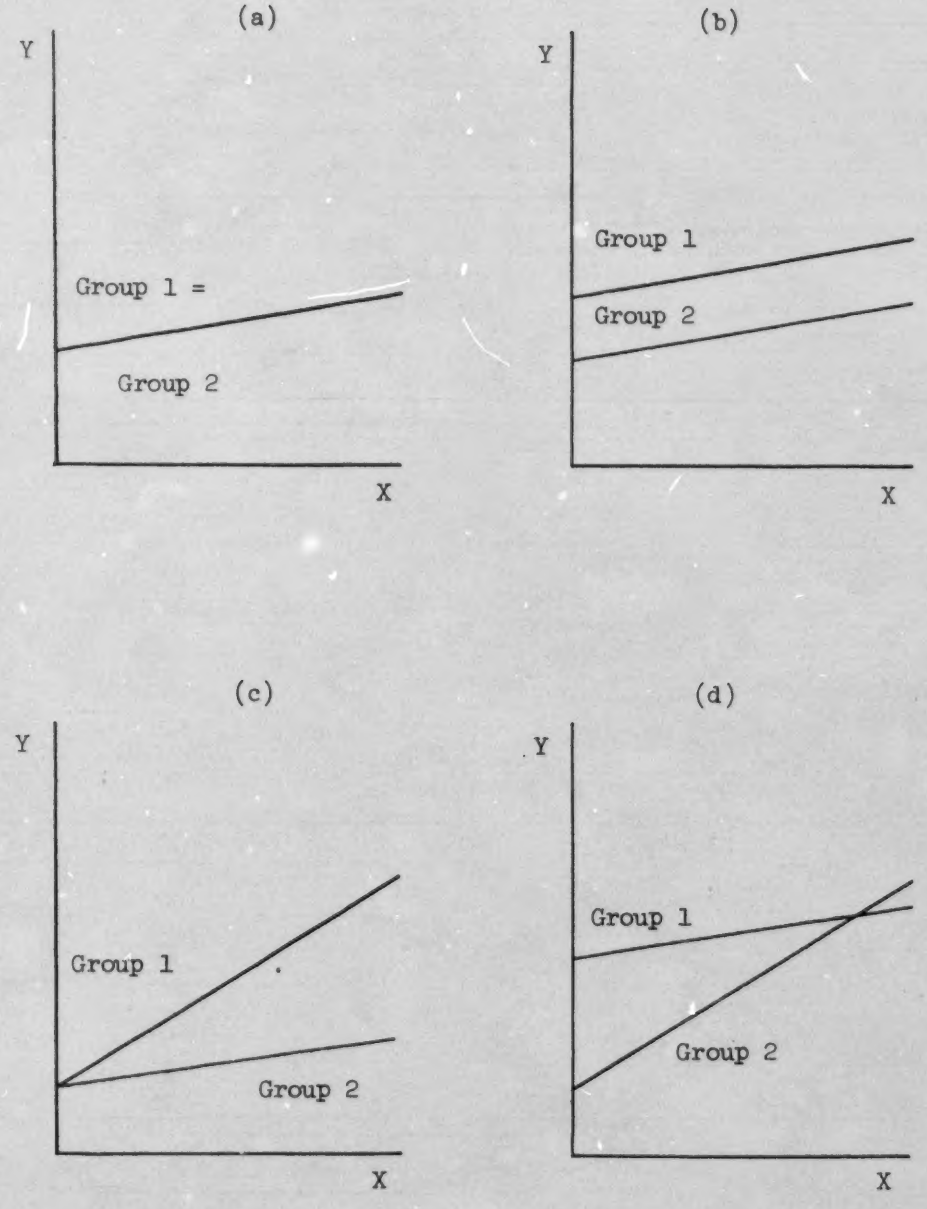

Figure A-1. Possible instances of a difference between regression lines for two groups ($Y = \hat{\alpha}_0 + \hat{\alpha}_1 X_1$).

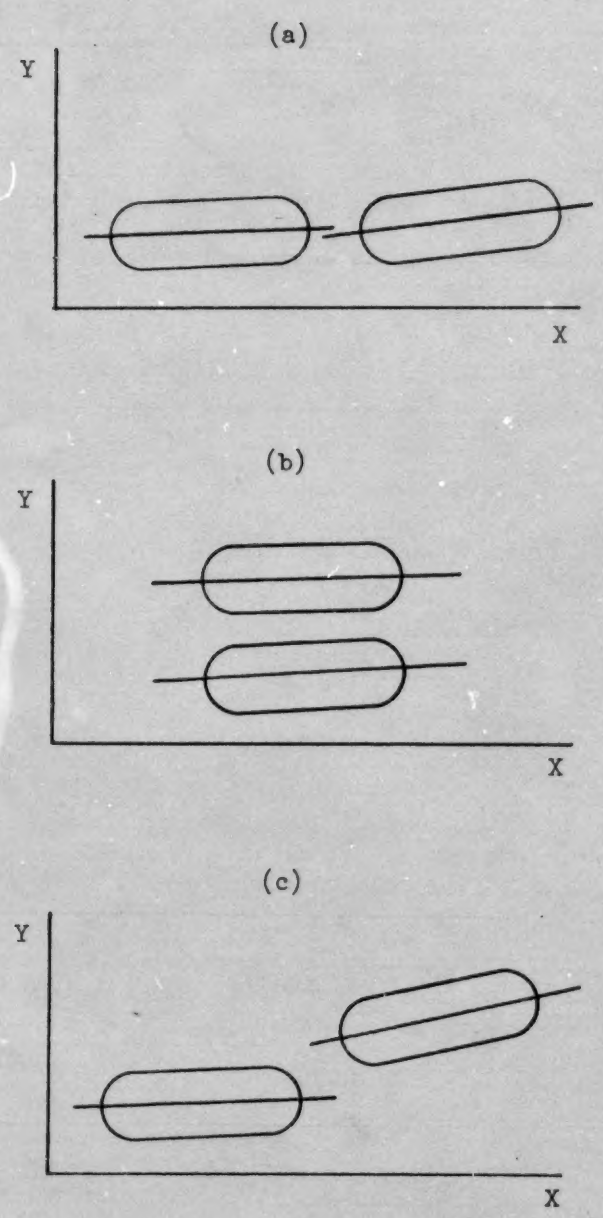

Figure A-2. Possible differences between regression lines for two groups, with nonoverlapping domains or ranges. (Model: $Y = \alpha_0 + \alpha_1 X_1$; ellipses represent concentrations of data.)

variable (or, of a set of variables) in reducing unexplained variance in the criterion measure. The following is an overview of these statistical tests.

F-tests and t-tests in Regression

In the first place, there are a variety of ways in which the "contribution" of a variable (or, set of variables) can be measured. Theil (1971) discusses two ways of allocating the total explanatory power of a model among individual variables, which he calls "unattractive" (p. 168) because each can yield "negative" portions. In matrix notation these are:

$$\hat{y}' \hat{y} = \hat{\beta}' X' y \text{ and } \hat{y}' \hat{y} = \hat{\beta}' X' X \hat{\beta}.$$

The method most commonly adopted involved "increments to R^2" which can be calculated as the difference between (a) the total explanatory power of a model when all explanatory variables are included and (b) the power where selected variable(s) are excluded. This difference is then attributed to the selected variable(s) in question and subjected to tests to determine its probability of being significantly different from zero.

One of the difficulties with this approach is that the sum of all "increments" will not necessarily equal the total power of the model. In fact, it may differ in either direction. The amount of the understatement or overstatement may be called "shared" explanatory power, "interaction" among the explanatory variables (Theil, 1971, p. 168), or "the multicollinearity effect" (Theil, 1971, p. 181). It arises from interdependence among the explanatory variables.[1]

The data in Table A-1 illustrate the application of the three decompositions discussed thus far: "incremental explained sums of squares" and the two relationships pointed out by Theil. In example (A) values are entirely well-behaved in that no negative values arise under any of the three methods of allocating explanatory power. In such a case, one might calculate the proportional ΔESS_i and illustrate with a diagram (Figure A-3).

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[1] If there is no interdependence, the problem does not arise and the increments will sum to the total. This special case is not of concern here.

Table A-1

Decomposition of Explanatory Power: Three Examples and Three Methods

Example	Method		
	$(\Delta ESS_i)^a$	$(\beta' X' X \beta)^b$	$(\beta' X' y)^c$
(A) $Y = f(X_6, X_8)$			
(Draper & Smith, 1966, Table 4.3, p. 116)			
Allocation to X_6	8.59[d]	8.99	12.84[e]
Allocation to X_8	35.84	37.49	41.34
"Shared" power	9.75	3.85 (x2)[b]	...[c]
Total model	54.18	54.18	54.18
(B) $Y = g(X_2, X_3)$			
(Johnston, 1972, Table 5-4, p. 147)			
Allocation to X_2	1173.7	1209.7	1192.4
Allocation to X_3	8.2	8.4	- 9.0
"Shared" power	1.5	- 17.4 (x2)[b]	..[c]
Total model	1183.4	1183.4	1183.4
(C) $Y = h(X_1, X_2)$			
(Gujarati, 1970b, Table 1, p. 19)			
Allocation to X_1	.03155	.051	- .023
Allocation to X_2	.17116	.278	.204
"Shared" power	-.02136	- .074 (x2)[b]	....[c]
Total model	.18135	.181	.181

Note. All numbers subject to rounding error.

[a] Calculation for allocation to $X_i = \hat{\sigma}^2 \underline{F} = \hat{\sigma}^2 \underline{t}^2 = \hat{\sigma}^2 \hat{\beta}^2 \cdot$ variance of $\hat{\beta} = \hat{\beta}^2 \cdot a_{ii}$, where a_{ii} is the diagonal element in $(X' X)^{-1}$ corresponding to X_i. "Shared" power = ESS - $\Sigma \Delta ESS_i$.

[b] Calculation for allocation to $X_i = \hat{\beta} \sum^n X_i^2$. "Shared" power = $\hat{\beta}_i \hat{\beta}_j \sum^n X_i X_j$; note that because there is both an (i, j) term and a (j, i) term which are equal to one another, we denote the "shared" as "(x2)."

[c] Calculations for allocation to $X_i = \hat{\beta}_i \sum^n X_i y$. There is no "shared" component with this method.

[d] In this case, (8.59) = $(1 - r_{6,8}^2)$ x (8.99), with $r_{6,8}$ being the zero-order correlation coefficient between X_6 and X_8; $r_{6,8} = -.21$, $r_{2,3} = -.17$, and $r_{1,2} = .62$. See Theil (1971, p. 166, equation 1.9).

[e] In this case, (12.84) = (8.99) + (3.85).

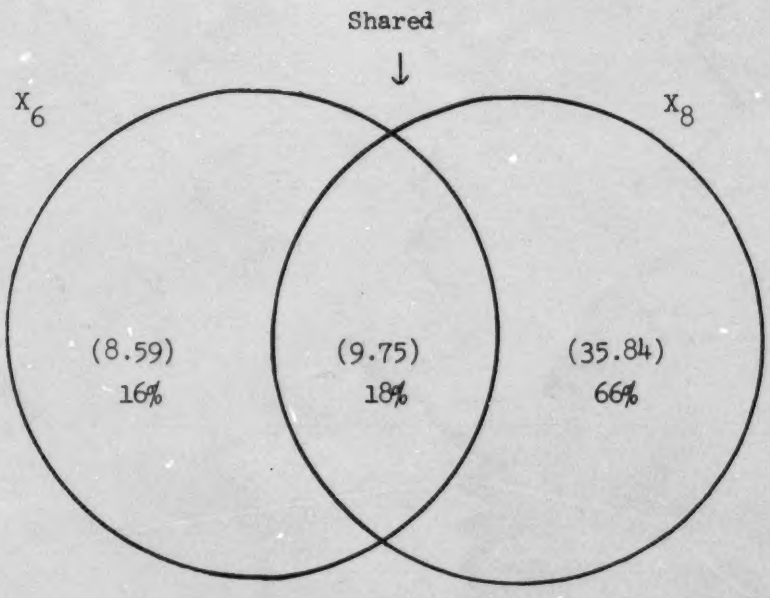

Figure A-3. Decomposition of explanatory power. (Using calculated increments to R^2 on example A of Table A-1.)

However, in this case one might challenge the test of ΔESS_i as unduly conservative. For instance, one might argue that the "shared" portion be distributed (e.g., half to X_6 and half to X_8) before performing the tests. Such a step would then lead to values greater than 8.59 and 35.84, increasing the likelihood of significance. In sum, by testing "only" the values 8.59 and 35.84 one ignores explanatory power which is accounted for jointly, the inclusion of which may well be warranted.

The same reasoning can apply in case (B), where again a positive "shared" value can be distributed and where, incidentally, both the second and third methods yield negative values. Finally, in example (C) one might challenge the test of ΔESS_i on other grounds. In this instance, it could be argued that the test is overly liberal in ignoring negative "shared" power.

One is forced to conclude that F-tests and t-tests of individual variables--which necessarily rely on the calculated ΔESS_i--may either understate or overstate the power of a variable. By similar reasoning, F-tests of the contribution of a set of variables--are subject to the same criticism. These relationships are important to bear in mind when considering specifically the methods recommended for testing intergroup differences in regression.

Recommended Methodology: Recent History

In the relatively recent past, such writers as Kullback and Rosenblatt (1957), Chow (1960), and Fisher (1970) have addressed the construction of tests for assessing the presence of differences among subsets of a sample. Essentially these test the hypothesis that one (or more, or all) regression coefficient(s) does not differ across groups by testing the change in unexplained sums of squares due to the introduction of a constraint. That is, the recommended methodology is a special case of tests of a general linear hypothesis.

More recently, Gujarati (1970a and 1970b) presented an alternate means to operationalize the performance of such tests by using conventional t-values of dummy variables and interaction terms. In contrast to the earlier writings, which were largely advanced mathematical presentations, Gujarati's articles were discursive illustrations of technique.

Lastly, Cramer (1972) criticized Gujarati's approach, reanalyzing data from Gujarati's example in an analysis of variance framework more nearly resembling the approach suggested

by the earlier authors. Gujarati's technique and Cramer's method of reanalysis provide sufficient contrast in approach to facilitate reviewing the many problems associated with the underlying basis of the methodology.

The Gujarati Approach

The method advanced by Gujarati (1970b) for testing the equality of regression relationships among substrata involves the creation of additional terms. These terms are the products of (a) a set of dummy variables which are "group identifiers" and (b) the set of explanatory variables in the basic model.[2] Gujarati claims to ascertain not only the presence of differences, but the nature of such differences, by observing t-values associated with the coefficients of the created terms. Beginning with a model containing two original explanatory variables, he identifies four subsets of interest in the sample and performs the following regression:

$$\begin{aligned} Y_j = {} & \alpha_0 + \alpha_1(D_{1j}) + \alpha_2(D_{2j}) + \alpha_3(D_{3j}) + \alpha_4(X_{1j}) \\ & + \alpha_5(D_{1j}X_{1j}) + \alpha_6(D_{2j}X_{1j}) + \alpha_7(D_{3j}X_{1j}) \\ & + \alpha_8(X_{2j}) + \alpha_9(D_{1j}X_{2j}) + \alpha_{10}(D_{2j}X_{2j}) \\ & + \alpha_{11}(D_{3j}X_{2j}) + \epsilon_j, \end{aligned}$$

$$j = 1, \ldots, N \qquad \text{(A-2)}$$

where:

X_{1j}, X_{2j}	= original explanatory variables for jth observation.
D_{kj}, $k = 1,2,3$	= dummy variables (= 1 if observation j lies in group k, = 0 otherwise).
$(D_{kj}X_{1j})$, $(D_{kj}X_{2j})$	= interaction terms, the product of a dummy variable and one of the original explanatory variables.

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[2]The intercept is considered one of the explanatory variables here.

$\alpha_1, \alpha_2, \alpha_3$ = differential intercept coefficients.

$\alpha_5, \alpha_6, \alpha_7$ = differential coefficients with respect to X_1.

$\alpha_9, \alpha_{10}, \alpha_{11}$ = differential coefficients with respect to X_2.

ϵ_j = stochastic term.

Specifically, the method involves examination of the t-values for the differential intercepts (i.e., t-tests of α_1, α_2, and α_3) and the differential slopes (i.e., t-tests of α_5, α_6, α_7, α_9, α_{10}, and α_{11}). He states that, at the extreme, if none of the t-values is statistically significant, then it can be concluded that the regressions for the groups do not differ. While perhaps intuitively appealing, there are several major problems with this approach.

Problems with Gujarati's Technique

First, as Cramer's article later pointed out, it is not at all valid to test:

$$H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_5 = \alpha_6 = \alpha_7 = \alpha_9 = \alpha_{10} = \alpha_{11} = 0 \qquad \text{(A-3)}$$

by "eyeballing" t-values. Second, his technique involves the selection of a "reference group," against which other groups are compared. There are at least two pitfalls in the use of a reference group.

For one, consider performing the basic equations for each group separately, leading to k = 1, . . ., K regressions; that is:

$$\begin{aligned} Y_1 &= \alpha_{01} + \alpha_{11}X_1 + \alpha_{21}X_2 + \epsilon_1 \\ Y_2 &= \alpha_{02} + \alpha_{12}X_1 + \alpha_{22}X_2 + \epsilon_2 \\ Y_3 &= \alpha_{03} + \alpha_{13}X_1 + \alpha_{23}X_2 + \epsilon_3 \\ Y_4 &= \alpha_{04} + \alpha_{14}X_1 + \alpha_{24}X_2 + \epsilon_4 \end{aligned} \qquad \text{(A-4)}$$

The results from the four regressions could be identical except

for the four coefficients of X_1; suppose then that $\alpha_{11} < \alpha_{12} < \alpha_{13} < \alpha_{14}$. One analyst choosing group 2 or group 3 as the reference group may find no statistically significant difference in a model of the form of equation (A-2), while another who chose group 1 or group 4 might well find statistically significant differences, particularly in the comparison of 1 with 4.

The second pitfall arises from the covariance of the regression coefficients. Generally:

$$V(\hat{\beta}) = \hat{\sigma}^2 (X' X)^{-1}. \qquad \text{(A-5)}$$

The separate regressions in (A-4) necessitate K matrices $(X' X)_k^{-1}$. At the same time equation (A-2) necessitates $(X' X)^{-1}_{\text{combined}}$. It can be shown that the diagonal elements in the K matrices $(X' X)_k^{-1}$ correspond to the diagonal elements in $(X' X)^{-1}_{\text{combined}}$. However, $\{\hat{\sigma}^2_k\} = \hat{\sigma}^2_{\text{combined}}$ is a necessary assumption (Chow, 1960; Fisher, 1970; Toyoda, 1974), whose violation will affect the t-values of regression coefficients in an equation of the form of (A-2).

Specifically, it can be shown that $\{\hat{Se}_i\}_{ref}$, the set of standard errors which correspond to the set of i coefficients produced for the reference group in the combined model, can differ from $\{Se_i\}_{ref}$, the set of corresponding standard errors for the equation (A-4) on the reference group alone because of unequal residual variances. In fact, it can be shown that:

$$\{\hat{Se}_i\}_{ref} = \{Se_i\}_{ref} \cdot \left[\frac{\hat{\sigma}^2_{\text{combined}}}{\hat{\sigma}^2_{ref}}\right]^{1/2} \qquad \text{(A-6)}$$

For the terms of equation (A-2) which are differentials between group h and the reference group:

$$\{\hat{Se}_i\}_{h\text{-}ref} = [\hat{\sigma}^2_{\text{combined}} \left(\frac{\{Se_i^2\}_{ref}}{\hat{\sigma}^2_{ref}} + \frac{\{Se_i^2\}_h}{\hat{\sigma}^2_h}\right)]^{1/2} \qquad \text{(A-7)}$$

That is, while the four regressions in (A-5) may be identical except for residual variance, the results of (A-2) can differ with choice of reference group. The t-values of the reference group coefficients, under the alternative choices of reference group, will vary positively with the residual variances of (A-4). In addition, given a choice of reference group, the t-values for differential terms will vary positively with the residual variances of (A-4).

Thus analysts may reach different conclusions depending on choice of reference groups. This is not acknowledged in Gujarati's presentation. Moreover, the author's assertion that $\{\hat{Se}_i\}_{h\text{-}ref}$ is available from the results of (A-2) via:

$$\text{S.e.}\ (\alpha_4 + \alpha_5) = [\text{Var.}\ (\alpha_4) + \text{Var.}\ (\alpha_5) + 2\ \text{Cov.}\ (\alpha_4, \alpha_5)]^{1/2} \qquad \text{(A-8)}$$

ignores residual variances and is therefore incomplete.

Third, the matrix of correlation coefficients which underlie the computation of equation (A-2) contains many very high values, several exceeding 0.95. This occurs because of the definitional interrelationships among the constructed terms (e.g., between D_1 and D_1X_1 and also between D_1X_1 and D_1X_2).

As a consequence of these correlations, the determinant of the correlation matrix in Gujarati's illustration is approximately 0.6×10^{-11}. Unfortunately, analysts adopting his approach, using various computer programs and various datasets, may not know when serious error has been introduced during the calculation of $(X'X)^{-1}$, given such small values for the determinant.[3]

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[3]This might be called "extreme multicollinearity," and consequently one might question the standard errors of the regression coefficients which the author presents for this model. However, even in this case of an extremely small determinant, it is still possible to begin with the standard errors from the highly-multicollinear model and arrive at the standard errors of the regression coefficients which are computed in regressions on each group separately. That is, there is no evidence that the standard errors have become unstable or non-calculable with the multiple regression computer program used here.

Fourth, as was shown earlier, t-values which are functions of ΔESS_i are affected by interdependence among the X's. Table A-2 contains t-values computed from seven separate regressions on Gujarati's data. Each of the regressions includes an intercept term, X_1 and X_2, and the selected differential terms shown for each in the table. As is evident, the introduction of differential terms on only one dimension (i.e., on the intercept alone, or on either of the X_i alone) yields significant t-values at $p < .10$ (i.e., regressions 1, 2, and 3). However, as more "inclusive" tests are performed, t-values fall precipitously as the opportunity for "shared" explanatory power increases. This phenomenon is a direct result of the use of variables which are highly intercorrelated because explanatory power is attributed less to individual variables and more to the "shared." It is doubtful that the t-values in regression 7 of the table are at all useful.

It is noteworthy that Gujarati also reported results from an abbreviated stepwise model, where terms were allowed to enter by sequential F-test. In fact, he reports from the t-tests on equation (A-2) that no intergroup differences exist and from the stepwise model that differences do exist, leaving the reader in doubt as to the outcome of the tests. Curiously, his stepwise sequence did not initially involve the forced entry of X_1 and X_2, but the intercept was forced. This is entirely arbitrary, and analysts will get different answers from the different "starting positions." Moreover, a backwards elimination beginning with the full model also produces different results. In any event, failure to force entry of original variables is serious; either one has a model or one does not. The test of differences among subsets presupposes a regression model.

Problems with Cramer's Approach

Cramer reviewed Gujarati's approach and reanalyzed the same data. Unfortunately, Cramer's reanalysis is not as illuminating as his criticism of the method proposed by Gujarati; the article is not at all clear as to which hypotheses are tested, or why these were selected.

At least part of the difficulty arises from peculiar choice of terminology. For example, the first test of Cramer's reanalysis uses the model shown as equation (A-2) above. The discussion of results, however, is disassociated from the model. Rather, Cramer refers to "treatment effects" and "regression coefficients" as being mutually exclusive--the former consisting of $\{\alpha_1, \alpha_2, \text{ and } \alpha_3\}$ and the latter $\{\alpha_5, \alpha_6, \alpha_7, \alpha_9, \alpha_{10}, \text{ and } \alpha_{11}\}$.

Table A-2

t-values of Differential Terms Added to $Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2$ in Different Combinations*

Added terms	t_{D_1}	t_{D_2}	t_{D_3}	$t_{D_1X_1}$	$t_{D_2X_1}$	$t_{D_3X_1}$	$t_{D_1X_2}$	$t_{D_2X_2}$	$t_{D_3X_2}$
1. D_1, D_2, D_3	2.45	0.29	1.88						
2. D_1X_1, D_2X_1, D_3X_1				2.50	0.20	1.75			
3. D_1X_2, D_2X_2, D_3X_2							2.57	0.19	1.86
4. Both (1) and (2) above	0.09	0.07	0.77	0.45	0.10	0.53			
5. Both (1) and (3) above	0.18	0.23	0.19				0.66	0.18	0.13
6. Both (2) and (3) above				0.23	0.05	0.56	0.55	0.01	0.79
7. (1), (2), and (3) above	0.09	0.15	0.66	0.14	0.15	0.75	0.58	0.01	0.61

Note: Each horizontal row contains t-values from a separate regression equation which contains (1) the intercept and X_1 and X_2 and (2) a selected set of interaction terms; in addition, all t-values are shown as absolute values.

*Source of data: Gujarati (1970b).

That is, Cramer's presentation does not consider α_1, α_2, and α_3 as "regression coefficients."

In any event, Cramer's first test, stemming from equation (A-2) is an F-test of:

$$H_0: \quad \alpha_5 = \alpha_6 = \alpha_7 = \alpha_9 = \alpha_{10} = \alpha_{11} = 0. \qquad \text{(A-9)}$$

This is a test of the contribution of all six $D_k X_i$, controlling for X_1, X_2 and D_k. However, little is presented by way of explanation for the choice of the test beyond giving different names to various coefficients. Such a test ignores the rich complexity of possible relationships shown in Figures (A-1) and (A-2) above.

One can better appreciate the substance of this test by recalling that, in the presence of correlated independent variables, the sum of "unique contributions" to reducing unexplained variance does not necessarily equal the total explained sum of squares of the model. In the case of equation (A-2) the "shared" or "joint" is very large in size relative to the "unique." Using the explained sums of squares calculated during the regressions shown in Table (A-2), the total was "decomposed"[4] (Figure A-4). Cramer's hypothesis is effectively a test of the sum of the following three components from the Figure:

$$\begin{array}{l} +.02697 \\ -.00532 \\ \underline{+.02755} \end{array} \qquad \text{(A-10)}$$

.04742 attributed to $\{\alpha_5, \alpha_6, \alpha_7, \alpha_9, \alpha_{10}$, and $\alpha_{11}\}$.

The null hypothesis is not rejected, which may not be at all surprising. Cramer then presents a second hypothesis, namely:

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[4] The method of this decomposition is described in Newton and Spurrell (1967).

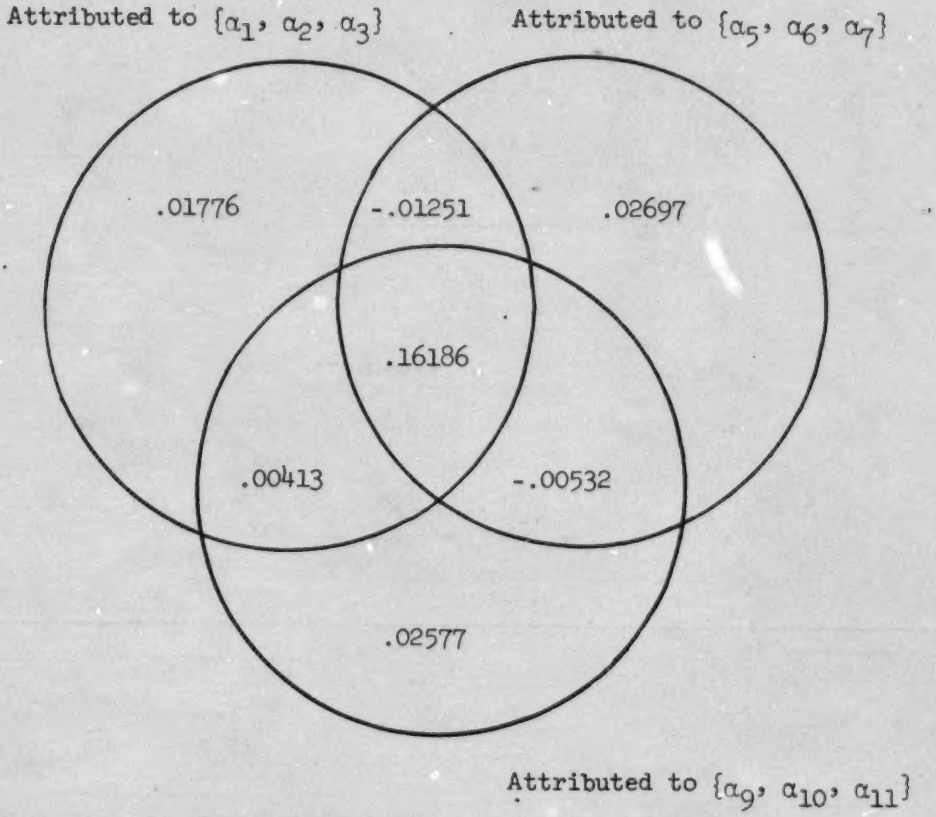

Figure A-4. Decomposition of explanatory power due to α_1, α_2, α_3, α_5, α_6, α_7, α_9, α_{10}, α_{11} of equation A-2.

$$\text{GIVEN: } Y_j = \tau_0 + \tau_1 D_{1j} + \tau_2 D_{2j} + \tau_3 D_{3j} + \tau_4 X_{1j} + \tau_5 X_{2j} + \epsilon_j, \quad j = 1, \ldots, N; \qquad \text{(A-11)}$$

$$H_0: \ \tau_1 = \tau_2 = \tau_3 = 0.$$

This is rejected, as he tests the sum:

$$\begin{array}{r} .01776 \\ -.01251 \\ .16186 \\ \underline{.00413} \end{array} \qquad \text{(A-12)}$$

.17124 attributed to $\{\alpha_1, \alpha_2, \text{ and } \alpha_3\}$.

On the basis of these results, he accepts equation (A-11) above. By comparison, several other possible models have higher $\underline{R}^2$ values than this one (e.g., compare in Table A-3 Cramer's choice which is equation 1 in the Table with equations 7 and 8 in the Table). Indeed, it appears that Cramer has accepted the relationship shown in Figure 1(b) above when 1(d) better describes the data.

Another way of viewing Cramer's method involves considering the F-statistic itself. Table A-4 contains the values of explained and unexplained sums of squares at various stages of one particular stepwise sequence, again with the same data. The F-statistic for reduction in error variance due to a set of variables is:

$$\underline{F}\ (\Delta\ df_1, df_2) = \frac{\Delta ESS/\Delta df_1}{USS/df_2} \qquad \text{(A-13)}$$

From the values in Table A-4, six different F's can be computed, depending on whether stage (a), (b), or (c) is the "starting" model and (b), (c), or (d) is the "ending" point. Rather than compute these, the reader's attention is directed to the inputs of such calculations.

First, the effects of interdependence are clear. The Explained Sum of Squares increases substantially with the entry of the first set of differential coefficients--that is, between (a) and (b)--and very little thereafter. Thus, the "shared"

Table A-3

Comparison of Explanatory Power of Alternative Models

Independent variables	Summary statistics	
Intercept term plus	R^2	$\bar{R}^2$
1) X_1, X_2, D_1, D_2, D_3	.345	.248
2) X_1, X_2, D_1X_1, D_2X_1, D_3X_1	.344	.248
3) X_1, X_2, D_1X_2, D_2X_2, D_3X_2	.360	.265
4) X_1, X_2, D_1, D_2, D_3, D_1X_1, D_2X_1, D_3X_1	.366	.202
5) X_1, X_2, D_1, D_2, D_3, D_1X_2, D_2X_2, D_3X_2	.365	.201
6) X_1, X_2, D_1X_1, D_2X_1, D_3X_1, D_1X_2, D_2X_2 D_3X_2	.374	.212
7) X_1, X_2, D_3, D_1X_1	.354	.280
8) X_1, X_2, D_3, D_1X_2	.359	.286
9) X_2, D_1, D_2, D_3, D_1X_1	.348	.253

Table A-4

Explained and Unexplained Sums of Squares at Different Stages of a Stepwise Regression

Stage	Explained sums of squares (df_1)	Unexplained sums of squares (df_2)
(a) Enter α_0, α_1, α_2	.18135 (2)	.84150 (37)
(b) Add D_1, D_2, D_3	.35259 (5)	.67026 (34)
(c) Add D_1X_1, D_2X_1, D_3X_1	.37424 (8)	.64861 (31)
(d) Add D_1X_2, D_2X_2, D_3X_2	.40001 (11)	.62284 (28)

Note. Calculations were drawn from selected steps of a forwards stepwise model with arbitrarily-selected sequence of entry.

power emerges at the first opportunity.[5] Secondly, at least in this example, calculations of the F between (a) and (c), as well as between (a) and (d), involve increases in both Δdf_1 and the quantity (USS/df_2). Each of these leads to smaller F-values. In sum, it appears that tests of an increasing number of regression coefficients can lead directly to a higher probability of finding "no significant difference" whatever. Indeed, the F from (a) to (d) which is formally a Chow test of the equality of all regression coefficients is:

$$F\ (9,28) = \frac{(.21866)/9}{(.62284)/28} = 1.09 \qquad \text{(A-14)}$$

which is not statistically significant at conventional levels, and which would lead one to believe that no difference whatever can be supported. In this instance, it appears that the tests obscure the existence of the very relationship one seeks to uncover.

Conclusions

Unfortunately, we emerge from our review without clear direction to a superior alternative. Some avenues seem promising. For one, analysts may be wise to perform the separate regressions of the form of (A-4). For another, we have reorganized the decomposition of Figure A-4 by considering the subset--not the variable--of prime importance (Figure A-5). This certainly appears to be more useful than that which underlies Cramer's approach.

In addition, we suspect that stepwise methods can be useful if appropriate care is taken. For example, beginning with the original variables (i.e., the intercept, X_1 and X_2) sequential entry by t-test of all possible differential terms (e.g., α_1, α_2, α_3, α_5, α_6, α_7, α_9, α_{10}, and α_{11} of equation A-2) may illuminate important differences with respect to either particular variables or groups before interdependence biases t-values and F-values.

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[5]The problem being illuminated here is closely related to the discussion of equations 1, 2, and 3 of Table A-2 above.

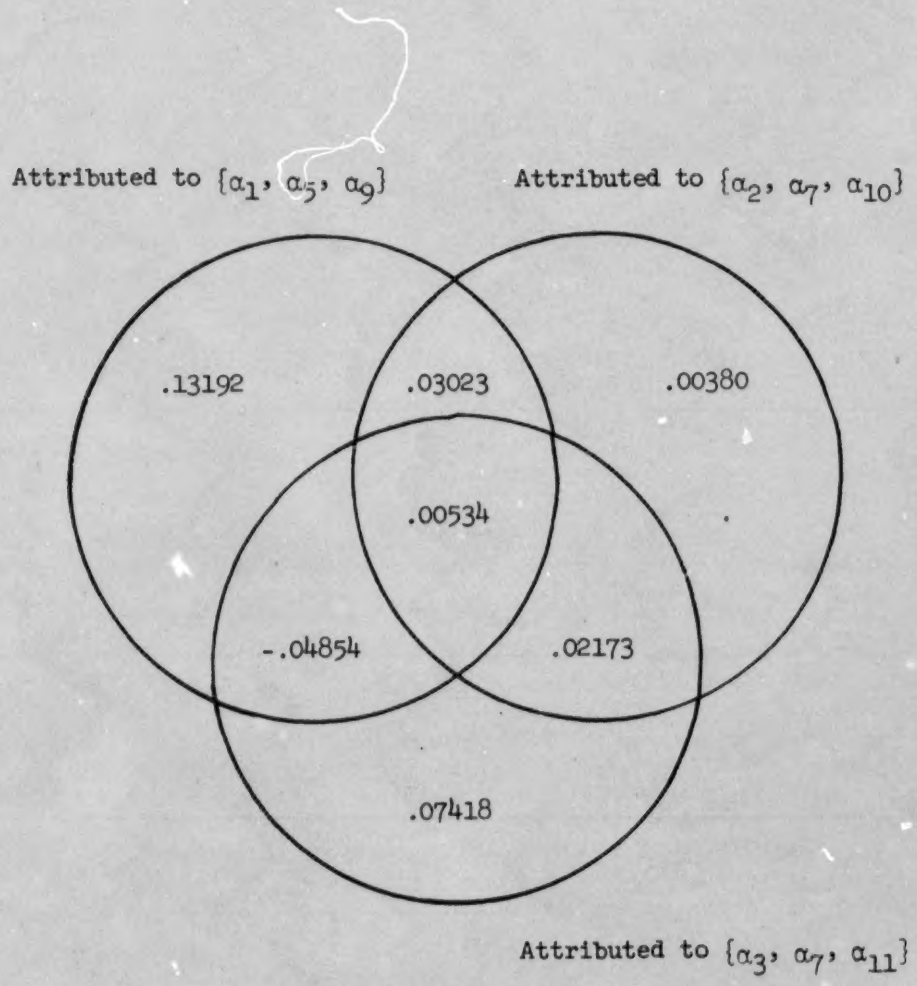

Figure A-5. Alternative decomposition of explanatory power due to α_1, α_2, α_3, α_5, α_6, α_7, α_9, α_{10}, α_{11} of equation A-2.

Lastly, in the absence of definitive methodology, we would argue for experimentation with both models and choice of reference group. At least in the case of micro models in the social sciences, relationships are seldom overwhelming. The careful analyst may require several approaches to ferret out the form which best describes his data. While such an approach may be criticized when it leads to fitting the characteristics of a particular sample, it will not be conservative for uncovering differences on specific variables and for individual subsets when they exist. Further research can then assist in determining the extent to which findings can be generalized.

In the present study we use an heuristic, explanatory approach. Specifically, when we desire to test differentials in a single model on more than one slope or on both the intercept and one or more slopes, we proceed as follows:

(1) Enter as control variables those in which we are not interested in performing a test of intergroup differentials.
(2) Add the variables in which we are interested in possible intergroup differentials.
(3) Observe the results when differential terms are then added under various circumstances (e.g., forwards F-tests or "backwards elimination").
(4) Judgmentally select the model which best portrays the presence and extent of differentials among substrata on the dimensions examined.

APPENDIX B

REGRESSION RESULTS

Table B-1

Regression Results: Occupational Information Test, by Race (Respondents Enrolled in Grades 10, 11, or 12 in 1966)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Scholastic aptitude	.12	8.59**	.18	6.70**
Socioeconomic index	.29	2.53**	.81	3.60**
Grade attending, 1966	1.81	7.92**	1.17	2.62**
Ever worked, 1966	.49	1.03	3.01	3.53**
Residence at age 14				
Rural farm	...[a]	...[a]	...[b]	...[b]
Rural nonfarm	1.51	1.98**	...[b]	...[b]
Small city	1.02	1.68**	1.54[b]	1.49[b]
Medium-sized city	1.21	1.78**	...[b]	...[b]
Large city	1.42	2.26	2.18	2.09**
High school curriculum				
General	...[a]	...[a]	...[a]	...[a]
Vocational	-1.08	-1.72*	-1.41[c]	-1.42[c]
Commercial	.25	.23	...[c]	...[c]
College preparatory	.51	1.19	.02	.03
Intercept term	-4.29	-1.48	-10.51	-1.94
Regression statistics				
Adjusted R^2	.19		.33	
F ratio	22.01		16.85	
Sample size (n)	1,003		257	
Dependent variable				
Mean value	33.18		29.00	
Standard deviation	6.21		6.84	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a]Reference group; the coefficient of each other variable in the same series represents the deviation of that group from the reference group.

[b]Due to small sample size among blacks, "rural farm" and "rural nonfarm" were combined to serve as the reference group (see footnote a), and "small city" and "medium-sized city" were combined.

[c]Due to small sample size, blacks from the commercial curriculum were excluded.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-2

Regression Results: Occupational Information Test, by Race (Respondents with Twelve Years of School; Not Enrolled in 1966)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Scholastic aptitude	.16	6.52**	.11	1.90**
Socioeconomic index	.60	3.17**	1.11	2.67**
Military service, 1966	- .31	- .45	-1.08	- .50
Residence at age 14	[a]	[a]	[b]	[b]
Rural farm	...	...	...[b]	...[b]
Rural nonfarm	.63	.69	...	...
Small city	.28	.38	- .64[b]	- .34[b]
Medium-sized city	.22	.25	...	...
Large city	1.30	1.56	2.84	1.46
Years of work experience, 1966	.59	4.48**	.22	.67
Received training, 1966	- .03	- .06	- .87	.55
High school curriculum	[a]	[a]	[a]	[a]
General	...	...	...	...
Vocational	- 1.10	-1.49	-1.37[c]	- .68[c]
Commercial	- .04	- .04	...	...
College preparatory	1.32	1.82*	- .43	- .20
Intercept term	12.29	4.05	11.91	2.11
Regression statistics				
Adjusted R^2	.17		.19	
F ratio	8.91		3.30	
Sample size (n)	474		92	
Dependent variable				
Mean value	37.35		32.24	
Standard deviation	6.17		6.71	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] See footnote a, Table B-1, Appendix B.

[b] See footnote b, Table B-1, Appendix B.

[c] See footnote c, Table B-1, Appendix B.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-3

Regression Results:[a] Participation in Post-School Training (Whites[b] with Twelve Years of School; in Labor Force and Not Enrolled in 1969)

Dependent variables	Explanatory variables								$\bar{R}^2$
	Scholastic aptitude	Socioeconomic index	Occupational information	Years of experience	Vocational	Commercial	College preparatory	Intercept	
All sources	.0020	.0230	.0006	.0496	.0421	.1003	.1566	-.1919	
	1.16	1.90**	0.19	7.63**	0.85	1.21	2.97**	- 0.89	.107
Business school or technical institute	.0006	.0267	-.0003	.0206	-.0370	-.0646	.0282	-.1523	
	0.04	2.64**	- 0.30	3.78**	- 0.89	- 0.94	0.64	- 0.84	.028
Company school	.0012	.0303	.0009	.0218	.0929	.0104	.0259	-.4226	
	0.88	3.20**	0.34	4.29**	2.40**	0.16	0.63	- 2.51	.044
Apprentice or other vocational or technical	.0016	.0074	-.0010	.0241	.0229	-.0921	-.0066	-.2300	
	1.56	1.04	- 0.54	6.38**	0.80	- 1.92*	- 0.21	- 1.84	.064
Military	.0013	-.0092	-.0014	.0373	-.0213	-.0241	-.0061	-.0348	
	1.10	- 1.11	- 0.62	8.37**	- 0.63	- 0.43	- 0.17	- 0.24	.112
Other source	-.0003	-.0029	.0032	.0073	.0185	.1763	.1601	.0862	
	- 0.17	- 0.27	1.13	1.28	0.42	2.43**	3.46**	0.45	.024
Professional or technical	.0019	.0163	.0026	.0184	-.0349	.0029	.1676	-.3471	
	1.27	1.56	0.94	3.31**	- 0.82	0.04	3.72**	- 1.83	.058
Managerial	-.0007	-.0028	.0016	.0086	-.0079	.0921	.0519	.0536	
	- 0.76	- 0.43	0.96	2.47**	- 0.29	2.09**	1.84*	0.47	.019
Clerical or sales	.0017	.0140	....[c]	.0188	.0253	.0362	.0202	-.3322	
	1.71**	1.99**	....[c]	5.44**	0.87	0.75	0.66	- 2.68	.042
Skilled manual	-.0001	.0065	....[c]	.0372	.0946	-.0354	-.0081	.0852	
	- 0.10	0.55	....	6.46**	1.96**	- 0.44	- 0.15	0.41	.060

(Table continued on next page.)

Table B-3

Continued

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a]Each horizontal line is a separate regression; the dummy dependent variable is given in the leftmost column; and independent variables are identified as column headings. Cell entries are regression coefficients and t-values.

[b]Due to small sample size, blacks were excluded from the analysis.

[c]Not entered; $F < 0.01$.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-4

Regression Results: Skill Level on First Jobs Held by Graduates, by Race (Respondents with Twelve Years of School; Not Enrolled in 1966)

Explanatory variables	GED rating				SVP rating			
	Whites		Blacks		Whites		Blacks	
	b	t	b	t	b	t	b	t
Scholastic aptitude	.005	.48	.010	.50	.003	.45	.023	2.37**
Socioeconomic index	.077	1.13	.088	.67	.079	1.99**	.028	.45
High school curriculum[a]	....	...	....	...	....	...	....	...
General	.380	1.32	-.813[b]	-1.17[b]	.300	1.81*	-.423[b]	-1.33[b]
Vocational	-.257	-.57	....	...	-.457	-1.76*	....	...
Commercial	.183	.65	1.362	1.92**	-.067	-.41	.156	.50
College preparatory	7.797	6.82	6.511	3.23	.223	.34	-1.220	-1.36
Intercept term								
Regression statistics								
Adjusted R^2	.00		.05		.01		.06	
F ratio	1.00		2.25		2.44		2.52	
Sample size (n)	484		96		484		96	
Dependent variable								
Mean value	9.149		8.304		1.297		.950	
Standard deviation	2.251		2.365		1.310		1.092	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] See footnote a, Table B-1, Appendix B.

[b] See footnote c, Table B-1, Appendix B.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-5

Regression Results: GED Ratings on 1969 Job, by Race (Employed Wage or Salary Workers with Twelve Years of School and Not Enrolled in 1969)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Residence in SMSA, 1969	- .02	- .12	.13	.28
Scholastic aptitude	.01	1.42	.02	1.19
Socioeconomic index	.06	1.19	.01	.05
Occupational information	.01	1.06	.04	1.49
Military service, 1969	- .44	-2.26**	.77	1.58
Years of work experience, 1969	.16	5.18**	- .09	-1.41
Received training, 1969	.77	4.41**	.61	1.65**
High school curriculum	[a]	[a]	[a]	[a]
General	...	...	...	...
Vocational	.19	.90	- .16[b]	- .37[b]
Commercial	.24	.65	...	...
College preparatory	.45	1.99**	.63	1.13
Intercept term	6.59	7.23	6.20	4.64
Regression statistics				
Adjusted R^2	.13		.08	
F ratio	9.23		2.25	
Sample size (n)	570		127	
Dependent variable				
Mean value	10.04		9.05	
Standard deviation	2.02		1.92	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] See footnote a, Table B-1, Appendix B.

[b] See footnote c, Table B-1, Appendix B.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-6

Regression Results: SVP Ratings on 1969 Job, by Race (Employed Wage or Salary Workers with Twelve Years of School and Not Enrolled in 1969)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Residence in SMSA, 1969	-.19	-1.65	.12	.52
Scholastic aptitude	.01	1.20	.01	1.14
Socioeconomic index	.04	1.04	-.00	- .08
Occupational information	-.01	- .56	.02	1.78**
Military service, 1969	-.23	-1.71**	.49	1.90
Years of work experience, 1969	.11	5.21**	-.10	-2.95
Received training, 1969	.09	.72	.27	1.37
High school curriculum[a]	[a]	[a]	[a]	[a]
General	...	...	...	...
Vocational	.21	1.43	.06[b]	.26[b]
Commercial	.13	.52	...	...
College preparatory	.25	1.54	.19	.66
Intercept term	.27	.42	-.03	- .04
Regression statistics				
Adjusted R^2	.05		.10	
F ratio	4.04		2.63	
Sample size (n)	570		127	
Dependent variable				
Mean value	1.62		1.28	
Standard deviation	1.35		1.02	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] See footnote a, Table B-1, Appendix B.

[b] See footnote c, Table B-1, Appendix B.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-7

Regression Results[a]: Hourly Rate of Pay, 1969, by Race (Employed Wage or Salary Workers with Twelve Years of School and Not Enrolled in 1969)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Residence in South, 1969	-.36	- 3.55**	- .71	-5.29**
Residence in SMSA, 1969	.31	3.40**	.26	1.47
Scholastic aptitude	.01	3.28**	.00	.81
Socioeconomic index	.01	.33	.02	.61
Occupational information	.02	2.41**	.01	.92
Military service, 1969	-.10	- .99	.16	.90
Years of work experience, 1969	.17	10.02**	.03	1.34
Received training, 1969	-.03	- .32	- .01	- .04
Differential terms				
Years of experience (vocational)	-.07	- 2.13**	...[b]	...[b]
Received training (vocational)	.79	3.34**	...[b]	...[b]
Intercept term	.29	.60	1.75	3.54
Regression statistics				
Adjusted R^2	.29		.29	
F ratio	23.47		7.59	
Sample size (n)	559		127	
Dependent variable				
Mean value	3.18		2.65	
Standard deviation	1.18		.82	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a]Each regression was run stepwise. Results shown are for the step at which all control variables had entered, but only statistically-significant differential terms had entered. See Table B-8 for other variants of this model for whites.

[b]Not entered in equations for blacks; F to enter: years (2.10), training (1.33). The value 2.10 represented the strongest of all differential terms for black youth, leading to t = 1.45.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-8

Regression Results: Hourly Rate of Pay, 1969 (White Employed Wage or Salary Workers with Twelve Years of School and Not Enrolled in 1969)

Explanatory variables	Differential terms forced[a]		Additional control variables[b]	
	Coefficient	t value	Coefficient	t value
Residence in South, 1969	-.36	-3.47**	-.20	-2.12**
Residence in SMSA, 1969	.31	3.36**	.31	3.73**
Scholastic aptitude	.01	3.30**	.01	3.65**
Socioeconomic index	.01	.52	.00	.03
Occupational information	.02	2.45**	.02	3.10**
Construction	...[c]	...[c]	.78	7.05**
Union	...	...	.52	6.33**
Military service, 1969	-.09	- .88	-.11	-1.19
Years of experience, 1969	.17	8.67**	.16	8.61**
Vocational differential	-.04	-1.09	-.05	-1.38
Commercial differential	-.00	- .04	-.00	- .08
College preparatory differential	.04	.98	.04	1.13
Received training, 1969	-.02	- .15	-.08	- .79
Vocational differential	.75	2.99**	.84	3.66**
Commercial differential	.11	.27	.00	.00
College preparatory differential	.01	.05	.16	.68
Intercept term	.46	.90	-.07	- .16
Vocational differential	-.16	- .74	-.16	- .80
Commercial differential	-.26	- .58	-.08	- .24
College preparatory differential	-.29	-1.22	-.35	-1.61
Regression statistics				
Adjusted R^2	.28		.40	
F ratio	14.26		21.78	
Sample size (n)	559		559	
Dependent variable				
Mean value	3.18		3.18	
Standard deviation	1.18		1.18	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a]This regression differs from the regression for white youth in Table B-7 in that all differential terms are forced into the model. Differentials for curricula other than general are reported under each of the three variables being tested: Years of work experience, Received training, and the Intercept term.

[b]This regression differs from that reported in footnote "a" above in that two additional control variables are included: construction (a dummy variable for industry of 1969 job) and union (a dummy term for whether wages at 1969 job are determined under a collective bargaining agreement).

[c]Not entered; see footnotes "a" and "b."

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-9

Regression Results[a]: Hourly Rate of Pay, 1966, by Race (Employed Wage or Salary Workers with Twelve Years of School and Not Enrolled in 1966)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Residence in South, 1966	- .32	-3.65**	-.90	-5.66**
Residence in SMSA, 1966	.25	3.12**	-.25	-1.27
Scholastic aptitude	.01	1.37	.00	.72
Socioeconomic index	.02	.59	.08	1.85
Occupational information	- .00	- .36	.03	2.50
Military service, 1966	- .19	-1.91**	.26	1.50
Years of work experience, 1966	.14	7.18**	-.06	-1.66
Received training, 1966	- .02	- .22	-.29	-1.50
Differential terms				
Received training (vocational)	.39	2.63**	...[b]	...[b]
Received training (college preparatory)	...[c]	...[c]	.59	1.63
Intercept term	1.26	2.84	.94	1.42
Regression statistics				
Adjusted R^2	.18		.38	
F ratio	11.60		7.08	
Sample size (n)	440		91	
Dependent variable				
Mean value	2.40		2.05	
Standard deviation	.87		.83	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a]See footnote a, Table B-7, Appendix B.

[b]Not entered in equation for blacks, F = 1.35.

[c]Not entered in equation for whites, F = .02.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-10

Regression Results: Hourly Rate of Pay, 1969 (White[b] Employed Wage or Salary Workers with Twelve Years of School and Less than Four Years of Work Experience and Not Enrolled in 1969)

Explanatory variable	Whites	
	Coefficient	t value
Residence in South, 1969	- .67	-5.04*
Residence in SMSA, 1969	.12	.99
Scholastic aptitude	.00	.53
Socioeconomic index	- .06	-1.62
Occupational information	.01	1.12
Military service, 1969	.07	.39
Years of work experience, 1969	.14	2.61*
Received training, 1969	.27	2.28*
High school curriculum		
General	...[a]	...[a]
Vocational	- .00	- .01
Commercial	- .40	-1.57
College preparatory	- .09	- .60
Intercept term	2.44	3.83
Regression statistic		
Adjusted R^2	.17	
F ratio	5.13	
Sample size (n)	227	
Dependent variable		
Mean value	2.60	
Standard deviation	.89	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a]See footnote a, Table B-1, Appendix B.

[b]Due to small sample size, blacks were excluded.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-11

Regression Results: Change in Hourly Rate of Pay, 1966 to 1969 (White[a] Employed Wage or Salary Workers, 1966 and 1969, with Twelve Years of School and Not Enrolled in 1966 and 1969)

Explanatory variables	Arithmetic difference, 1969-1969		Proportional increase 1966-1969	
	Coefficient	t value	Coefficient	t value
Hourly rate of pay, 1966	-.29	-4.18**	-.37	-10.81**
Residence in South, 1966	-.01	- .10	-.05	- .73
Residence in SMSA, 1966	.17	1.44	.07	1.28
Scholastic aptitude	.01	1.73**	.01	1.86**
Socioeconomic index	.03	.68	.02	.88
Occupational information	.02	1.55	.00	.95
Received training, 1966	.00	.03	-.03	- .52
Received training, 1966-1969	.19	1.64**	.02	.27
High school curriculum	[b]	[b]	[b]	[b]
General	...	...	...	...
Vocational	.05	.32	.07	.90
Commercial	-.11	- .43	-.10	- .84
College preparatory	-.10	- .60	-.03	- .34
Intercept term	-.14	- .20	.59	1.80
Regression statistics				
Adjusted R^2	.06		.27	
F ratio	2.70		11.61	
Sample size (n)	309		309	
Dependent variable				
Mean value	1.13		.56	
Standard deviation	.99		.55	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] Due to small sample size, blacks were excluded.

[b] See footnote a, Table B-1, Appendix B.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-12

Regression Results: Duncan Index of 1969 Job, by Race (Employed Wage or Salary Workers with Twelve Years of School and Not Enrolled in 1969)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Residence in SMSA, 1969	.25	.17	4.62	1.18
Scholastic aptitude	.06	.07	.13	1.10
Socioeconomic index	.04	.08	.80	.81
Occupational information	.30	2.41**	.44	1.96**
Military service, 1969	-2.80	-1.58	9.88	2.36**
Years of work experience, 1969	1.23	4.42**	-1.73	-3.27
Received training, 1969	8.77	5.47**	5.56	1.75**
High school curriculum				
General	...[a]	...[a]	...[a]	...[a]
Vocational	-2.52	-1.31	-3.67[b]	- .97[b]
Commercial	7.94	2.37**	...	...
College preparatory	6.17	2.97**	8.00	1.69*
Intercept term	3.60	.43	-7.45	- .65
Regression statistics				
Adjusted R^2	.18		.21	
F ratio	13.33		4.74	
Sample size (n)	559		127	
Dependent variable				
Mean value	32.15		24.57	
Standard deviation	18.89		17.63	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] See footnote a, Table B-1, Appendix B.

[b] See footnote c, Table B-1, Appendix B.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-13

Regression Results: Occupational Earnings on 1969 Job, by Race (Employed Wage or Salary Workers with Twelve Years of School and Not Enrolled in 1969)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Residence in SMSA, 1969	- 51.8	- .50	512.1	1.85**
Scholastic aptitude	5.4	1.14	0.2	.02
Socioeconomic index	12.2	.36	69.3	1.00
Occupational information	- 1.0	- .12	36.8	2.32**
Military service, 1969	- 159.2	-1.30	778.2	2.63
Years of work experience, 1969	133.6	7.05**	- 97.9	-2.61
Received training, 1969	278.7	2.54**	67.8	.30
High school curriculum	[a]	[a]	[a]	[a]
General	...	...	...	...
Vocational	- 165.8	-1.25	- 126.8[b]	- .47[b]
Commercial	600.8	2.62**	...	...
College preparatory	273.5	1.90*	449.0	1.33
Intercept term	3301.1	5.73	2239.2	2.77
Regression statistics				
Adjusted R^2	.14		.16	
F ratio	10.28		3.65	
Sample size (n)	570		127	
Dependent variable[c]				
Mean value	4737.0		4184.5	
Standard deviation	1285.0		1210.4	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] See footnote a, Table B-1, Appendix B.

[b] See footnote c, Table B-1, Appendix B.

[c] Value of the dependent variable for each respondent is the median earnings of all workers in the occupation category containing the respondent's 1969 job.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-14

Regression Results: Proportion "Highly Satisfied" with 1969 Job, by Race (Employed Wage or Salary Workers with Twelve Years of School and Not Enrolled in 1969)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Hourly rate of pay, 1969	.04	1.82**	.08	1.45
Residence in SMSA, 1969	.03	.66	.27	2.26**
Scholastic aptitude	-.00	-1.42	-.00	- .21
Socioeconomic index	-.01	- .37	-.07	-2.34
Occupational information	-.00	- .55	.00	.58
Military service, 1969	.03	.64	-.00	- .03
Years of work experience, 1969	.02	2.21**	.03	1.86**
Received training, 1969	.02	.48	-.10	-1.08
High school curriculum	[a]	[a]	[a]	[a]
General	...	...	...	...
Vocational	.02	.36	.14[b]	1.25[b]
Commercial	.18	1.89*	...	...
College preparatory	.12	1.96**	-.07	- .51
Intercept term	.61	2.55	.34	1.00
Regression statistics				
Adjusted R^2	.03		.07	
F ratio	2.70		1.93	
Sample size (n)	559		127	
Dependent variable				
Mean value	.50		.33	
Standard deviation	.50		.47	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] See footnote a, Table B-1, Appendix B.

[b] See footnote c, Table B-1, Appendix B.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-15

Regression Results: Amount of Unemployment, 1968-1969, by Race (Respondents with Twelve Years of School; Not Enrolled and in Labor Force in 1969)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Residence in SMSA, 1969	- .76	1.01	2.51	.79
Scholastic aptitude	- .02	.70	.14	1.41
Socioeconomic index	.18	.73	.27	.34
Occupational information	.01	.18	- .18	1.01
Military service, 1969	.93	1.04	-4.64	1.37
Years of work experience, 1969	- .51	3.77**	.09	.22
Received training, 1969	- .88	1.12	-3.01	1.18
High school curriculum				
General	...[a]	...[a]	...[a]	...[a]
Vocational	.12	.12	.22[b]	.07[b]
Commercial	.50	.31	...	...
College preparatory	1.02	.98	-4.89	1.26
Intercept term	5.91	1.41	-3.53	.38
Regression statistics				
Adjusted R^2	.02		.00	
F ratio	2.63		0.90	
Sample size (n)	643		137	
Dependent variable[c]				
Mean value	2.70		4.57	
Standard deviation	9.25		13.08	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] See footnote a, Table B-1, Appendix B.

[b] See footnote c, Table B-1, Appendix B.

[c] Dependent variable computed by 100 $(\frac{a}{a+b})$, where a = number of weeks of unemployment and b = number of weeks worked, between the 1968 and 1969 NLS surveys.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-16

Regression Results: Incidence of Unemployment, 1968-1969, by Race (Respondents with Twelve Years of School; Not Enrolled and in Labor Force in 1969)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Residence in SMSA, 1969	-.01	.12	.18	1.22
Scholastic aptitude	-.00	1.64**	.01	1.59
Socioeconomic index	-.00	.30	.01	.30
Occupational information	.00	1.03	-.00	.13
Military service, 1969	-.01	.15	.04	.23
Years of work experience, 1969	-.05	5.47**	-.01	.47
Received training, 1969	-.06	1.27	-.17	1.47
High school curriculum[a]				
General	...	...	...	...
Vocational	.02	.25	.16[b]	1.18[b]
Commercial	.01	.07	...	...
College preparatory	.04	.54	-.26	1.51
Intercept term	.76	2.83	-.38	.91
Regression statistics				
Adjusted R^2	.05		.02	
F ratio	4.61		1.32	
Sample size (n)	643		137	
Dependent variable[c]				
Mean value	.23		.31	
Standard deviation	.60		.60	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] See footnote a, Table B-1, Appendix B.

[b] See footnote c, Table B-1, Appendix B.

[c] Dependent variable is the number of spells of unemployment occurring between the 1968 and 1969 NLS surveys, where a spell is defined as a continuous period of one week or more.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

Table B-17

Regression Results: Unemployment Status, 1969 Survey, by Race (Respondents with Twelve Years of School; Not Enrolled and in Labor Force in 1969)

Explanatory variables	Whites		Blacks	
	Coefficient	t value	Coefficient	t value
Residence in SMSA, 1969	- .82	.54	3.82	.79
Scholastic aptitude	.02	.31	.09	.60
Socioeconomic index	.74	1.52	.12	.10
Occupational information	.05	.36	- .19	.70
Military service, 1969	- .91	.50	-7.15	1.40
Years of work experience, 1969	- .62	2.26**	- .21	.33
Received training, 1969	-1.95	1.23	3.19	.83
High school curriculum				
General	...[a]	...[a]	...[a]	...[a]
Vocational	-1.44	.74	.07[b]	.02[b]
Commercial	2.03	.62	...	...
College preparatory	1.47	.71	-7.36	1.26
Intercept term	-3.00	.35	.43	.03
Regression statistics				
Adjusted R^2	.02		.00	
F ratio	2.01		0.60	
Sample size (n)	643		137	
Dependent variable[c]				
Mean value	3.59		3.93	
Standard deviation	18.63		19.51	

Note. Results are based on weighted regression, where each case is weighted by the inverse of the sampling ratio.

[a] See footnote a, Table B-1, Appendix B.

[b] See footnote c, Table B-1, Appendix B.

[c] Dependent variable created with the value "1" if unemployed during the reference week of the 1969 NLS interview and "0" if employed, times 100.

* Significant at .10 level (two-tailed test; shown for variables based on curriculum only).

** Significant at .05 level (one-tailed test for control variables; two-tailed test for variables based on curriculum).

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16. Abstracts: This study of non-college-attending, male high school graduates examines the several different high school curricula--vocational, general, and college preparatory programs of study--as well as certain post-school training opportunities to uncover differences in effectiveness of the school programs--either alone or in conjunction with post-school programs--in preparing youth for careers. Based upon data from the National Longitudinal Surveys of Young Men 1966-1969, the following serve as criterion measures in a multivariate framework: (1) a general occupational information test, (2) attitudes toward adequacy of preparation, (3) participation of post-school training, (4) skill level of jobs, (5) wages, (6) measures of career potential, (7) overall job satisfaction, and (8) unemployment experience.

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Apprenticeship
Attitudes
Benefit cost analysis
Cost effectiveness
Counseling-vocational interests
Earnings
Economic analysis
Education (includes training)
Effectiveness
Employment
Ethnic groups
Evaluation
Government policies
Industrial training
Job satisfaction
Labor
Learning
Males
Manpower
Mathematical models
Negroes
Orientation (training)
Performance evaluation
Placement
Productivity
Program instruction
Qualifications
Reference groups
Salary surveys
Schools
Skilled workers
Socioeconomic status
Specialized training
Statistical analysis
Students
Surveys
Theses
Training devices
Unemployment
Unskilled workers

17b. Identifiers/Open-Ended Terms

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Vocational education
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THE CONTRIBUTIONS OF VOCATIONAL EDUCATION, TRAINING AND WORK EXPERIENCE TO THE EARLY CAREER ACHIEVEMENTS OF YOUNG MEN

By

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This study examines the role of several factors in the preparation of young men for the world of work in America. Specifically, the study addresses the impact of alternative high school curricula--the vocational, general, and college preparatory programs of study--as well as certain post-school opportunities for training and learning in preparing youth for careers. Specific reference is made to possible relationships between the high school program and the post-school career development activities.

The empirical work is based on data for high school graduates who did not attend college in a national sample of male youth: the National Longitudinal Surveys, a research project sponsored by the Manpower Administration, U.S. Department of Labor. A wide variety of vocationally-relevant criterion measures are used: (1) scores on a test of general

occupational information, (2) attitudes of the youth towards the adequacy of their preparation for work, (3) participation in post-school programs of various kinds, (4) skill level of first jobs and subsequent jobs, (5) wages--including starting wages as well as wage increases attributable to additional training and work experience, (6) measures of long run career potential, (7) overall job satisfaction, and (8) unemployment experience. In most cases, multiple regression is used to identify and measure the net effects of educational and training variables by controlling statistically for other influences, especially differences in the socioeconomic level of family background and in scholastic aptitude test scores. In addition, separate analyses are conducted for white and black youth.

In brief, the findings of the study do not support the view that vocational education at the secondary level is superior preparation for the world of work. First of all, vocational students were undistinguished on the occupational information test. Second, in the expressed desire for--and subsequent acquisition of--post-school training, the data for graduates of each curriculum were highly similar to one another. Third, analysis of the skill level of jobs obtained by the youth again failed to indicate an advantage for graduates of vocational programs.

Comparisons of graduates of the different programs with respect to the other criterion measures produced mixed findings

for white youth. For example, among young whites with no post-school training, no curricular differences in wages were found. Yet graduates from vocational (except commercial) programs seem to have the highest wage payoff to additional training. However, other findings suggest that youth from commercial and college preparatory programs have the most favorable long run career prospects and enjoy greatest job satisfaction. In contrast to the findings for whites, virtually no curricular differences were found in the analyses of young blacks.

Implications for secondary education and for those responsible for the development of educational and training policy are drawn from the findings. These implications concern the role of curricular choice in the process of career development, the allocation of resources among education programs, and the role and availability of post-school opportunities for training and learning for all youth. Particularly in the latter case, the findings suggest the need for special efforts to assist the process of career establishment among young blacks.